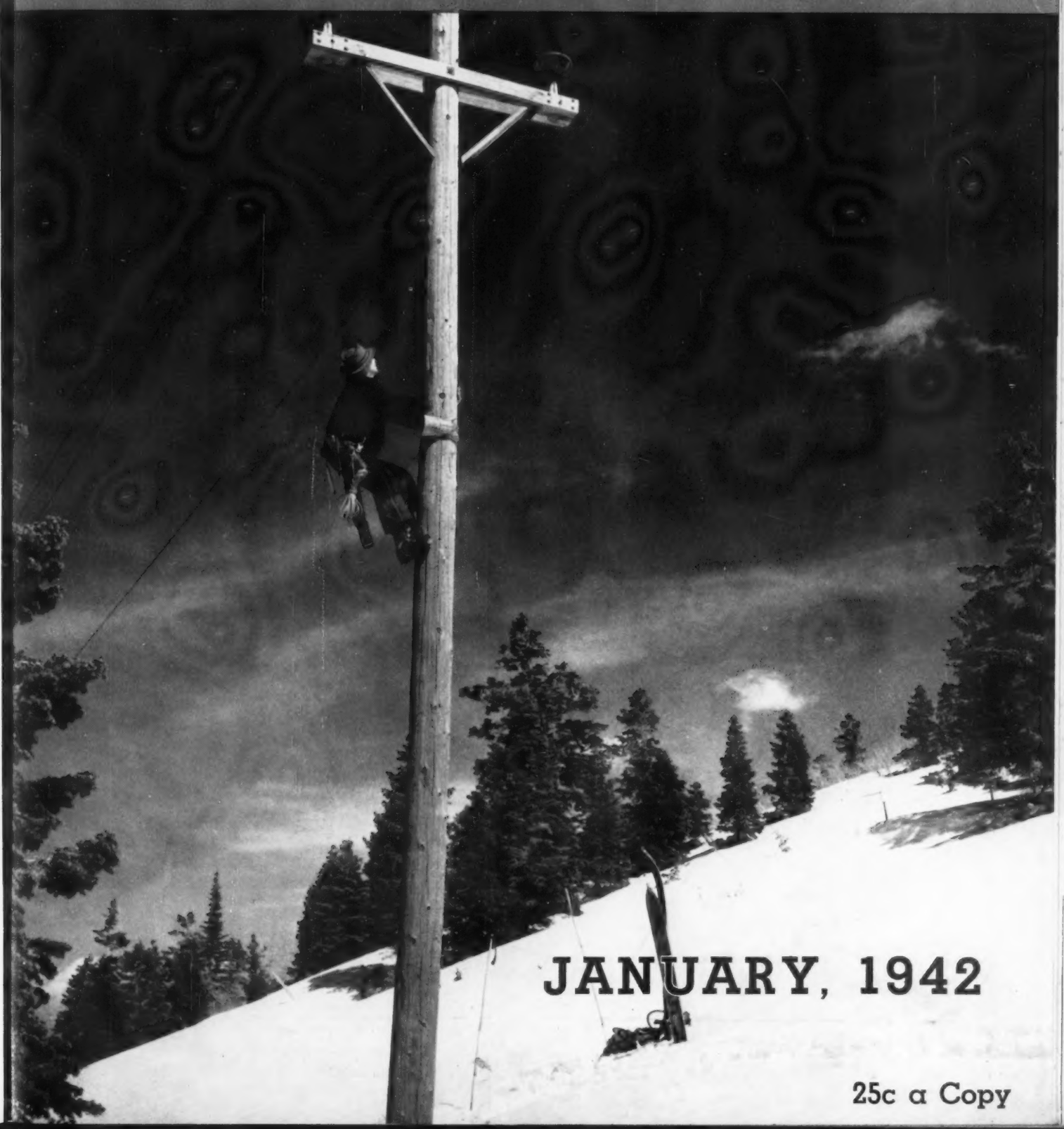
ELECTRICAL WEST

THE ALL-INDUSTRY MAGAZINE OF PROGRESS



JANUARY, 1942

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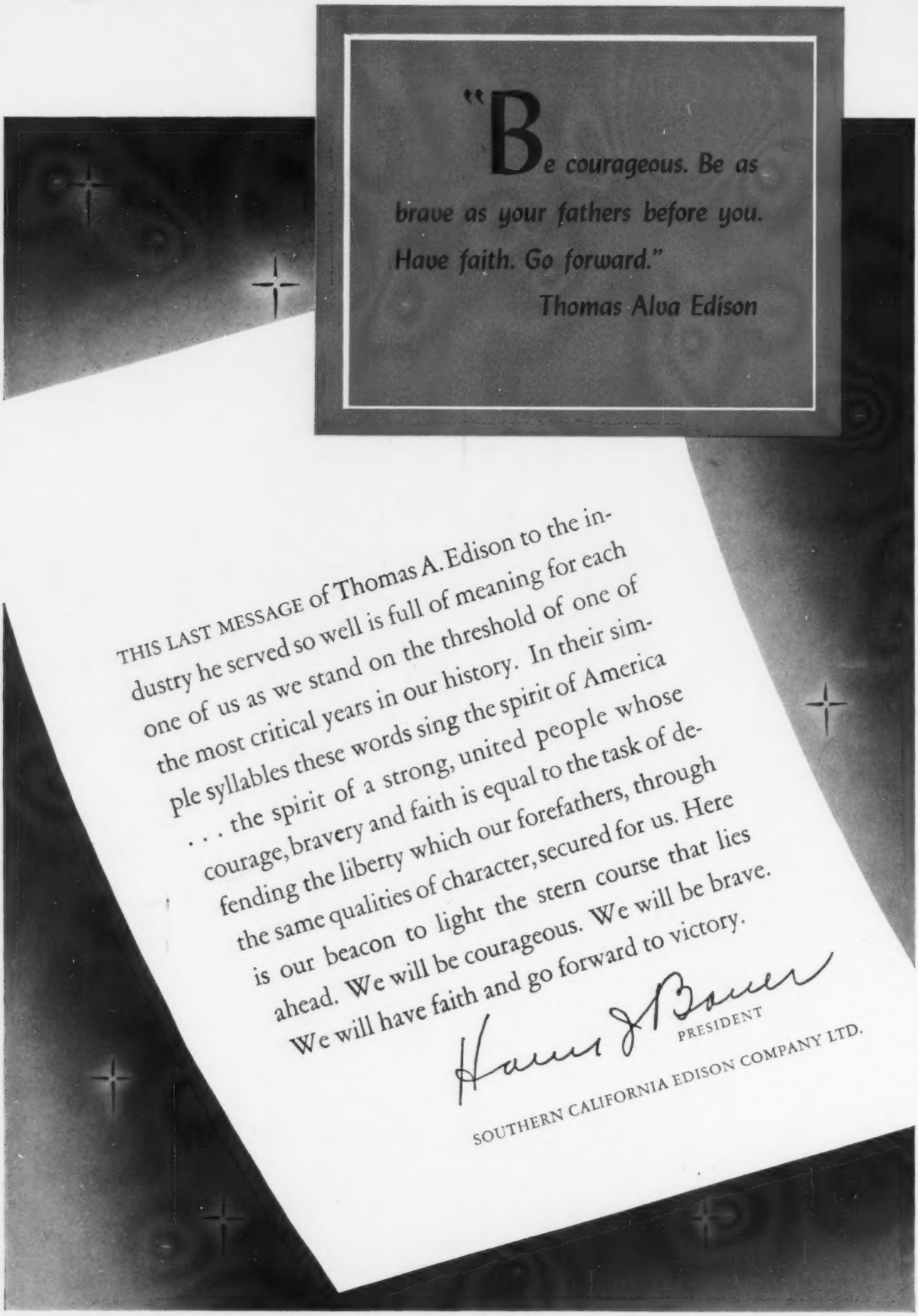
"Be courageous. Be as brave as your fathers before you. Have faith. Go forward."
Thomas Alva Edison
THIS LAST MESSAGE of Thomas A. Edison to the industry he served so well is full of meaning for each one of us as we stand on the threshold of one of the most critical years in our history. In their simple syllables these words sing the spirit of America . . . the spirit of a strong, united people whose courage, bravery and faith is equal to the task of defending the liberty which our forefathers, through the same qualities of character, secured for us. Here is our beacon to light the stern course that lies ahead. We will be courageous. We will be brave. We will have faith and go forward to victory.
PRESIDENT
SOUTHERN CALIFORNIA EDISON COMPANY LTD.

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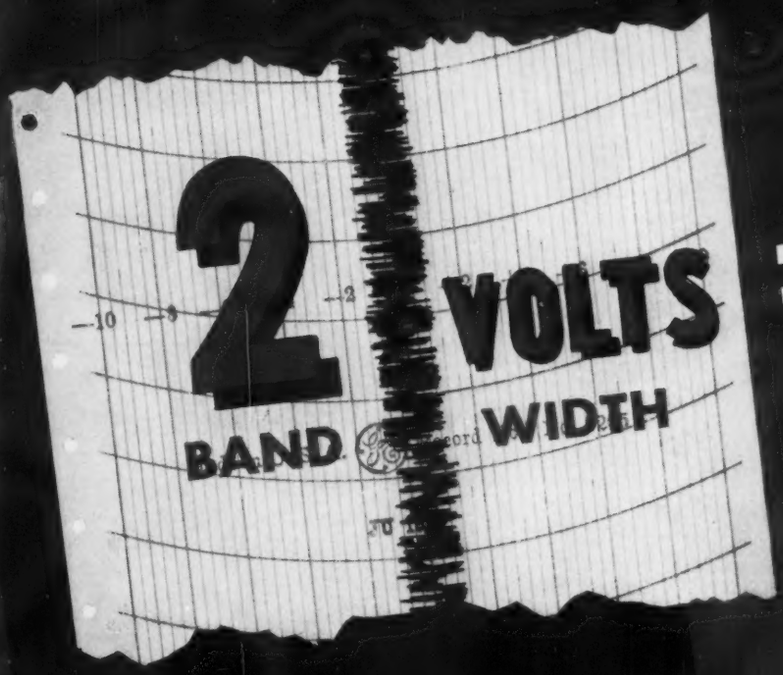


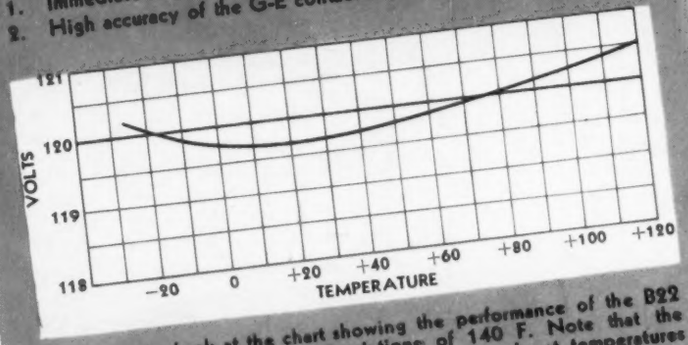
2 VOLTS BAND WIDTH = 500 KVA

That's the EXTRA load-carrying capacity you get on a typical feeder with G-E INDUCTION REGULATORS*

WHY G-E INDUCTION REGULATORS Hold a Narrower Band Width

The closer regulation of the G-E induction regulator is based primarily on

1. Immediate response—without time delay—to voltage changes
2. High accuracy of the G-E contact-making voltmeter



For example, look at the chart showing the performance of the B22 voltmeter under temperature variations of 140 F. Note that the maximum error—one-half volt—is approached only at temperatures above 110 F.

Compare this curve with those for other contact-making voltmeters and you'll see one important reason why G-E regulation is better regulation.

YOU get a bonus of one-third or more *additional* capacity when you regulate your feeders with G-E induction voltage regulators. Recent tests show that they hold the effective band width to 2 volts or less, not 4 volts or more as provided by other types of regulation.

The narrower G-E band width permits you to add more load to your present feeders—500 kva uniformly distributed for a typical case—while maintaining the present peak-load voltage difference between the first and last transformer. Or, you can use the band-width advantage to increase feeder length. You may also elect to recover revenue lost because of feeder voltage drops.

These are operating benefits that enable G-E induction voltage regulators to pay you a large extra return on your investment in regulation. Ask your G-E representative to estimate the results you can obtain on your feeders. General Electric Co., Schenectady, N. Y.

★For Engineers Who Like to Do Their Own Figuring:
This typical example is based on a reduction of two volts in band width on a 3-phase, 225-amp, 4-kv feeder of 4/0 conductor; 53-inch equivalent spacing; length, 10,000 feet; load uniformly distributed, power-factor, 90%.

GENERAL ELECTRIC

404-19-5400

Here in the WEST

People

Charles D. Gibson
prefaced his advice to electircal men as to the proper approach to the school lighting problem (p. 53) with a good-natured debunking of the architect, the illuminating engineer and the school superintendent, (which he is himself) at a PCEA conclave. It is to be regretted that space for those scintillating and incisive remarks was not available in this issue.

Philip H. Brown
who describes the City of Tacoma's sodium installations (p. 38) speaks from a considerable experience there. It began in 1924, when he worked on Cushman No. 1 plant. That was civil engineering. Except for a couple of short interludes, including a year with the City of Shelton, he has worked for Tacoma—2 years in the meter department, doing design work on Cushman No. 2, and for several years in engineering, as at present.

Year ago he had the enlightening experience of designing a distribution system—from scratch—for a city of 20,000. This town-which-grew-overnight is the Army's 41st Division cantonment, near Tacoma.

Preview

Before and After
One of the most spectacular years in electrical history has closed and one of the most uncertain is beginning. In the past the performance of preceding years could be projected with reasonable certainty into the new year and the predictions come out fairly close. The events of the last month have given a new twist to the curves and the direction now is less certain. Nevertheless it is of interest to all thoughtful persons in the electrical industry to know what transpired in 1941 and what the best judgement of informed sources forsees for the future.

Engineers
will find of value the review of construction and plant expansion during 1941 and the projects in view for 1942. Certain trends will be discerned and adjustments made necessary by the war.

Dealers
will scan with more than usual concern the sales figures and trends which the reports from every section of the West will enable him to piece together. For the distributor these same figures will be of deep interest.

Contractors
will be able to deduct what possibilities lie ahead in the reflection of engineering construction that may come their way or the sales effort that will bring installation as a necessary result. Suppliers too will read between these lines.

Pages

Blackout 31
Life—and lights—must go on, even if obscured from view. A concise summary of what to do and how to advise the industry's customers is presented here.

Defense Measures for Plant Security 34
Prepare for any eventuality is warning to Coast power utilities. Hence this resume of anti-subversive measures and passive defense activities based on British experience.

Adequate Lighting for Plant Protection 41
Protective lighting must be intelligently handled to achieve worthwhile results; methods and types of lighting vary with conditions of protective job to be done.

Home Service Training Is a Parade 44
Matrimony picks off well trained home advisors almost as fast as they can be trained, but its still worthwhile according to Washingtn Water Power Co.

New Products 4
Bulletins, etc. 16
Electra's Husband 26
Engineering 34
Sales 44
Sales Guide 45
Lighting and Wiring 33
Editorials 61
Associations 51
News 64

Cover photo is of Utah Power & Light Co. line patrolman on winter patrol.

Hotpoint Leadership Again Demonstrates Its Value to Retailers

AS leaders in the Electric Range industry, Hotpoint again bears the standard of dependable quality by announcing a continuation of the features and manufacturing policies which made 1941 the greatest year in Electric Range history.

In order to cooperate with our country's war effort in the conservation of machine tools, manpower and precious materials, we shall, until further notice, follow the policy of constantly improving the line without introducing yearly models.

Hotpoint's plans for 1942 include a program to strengthen the position of Hotpoint and its retailers through new strategy in its advertising and sales promotion. This embodies novel and effective ideas keyed to the current conditions. Headed by a new National Advertising campaign reaching 25 millions of families with a timely appeal and supported by the great new movie "Sauce For The Gander," Hotpoint retailers will find ample activities to fortify their positions and keep sales rolling. Get in touch with your distributor today and learn the whole Hotpoint program for 1942. Edison General Electric Appliance Co., Inc., 5612 W. Taylor St., Chicago, Ill.

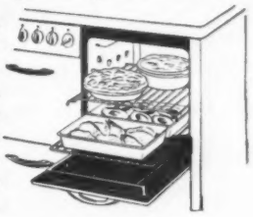
THE ARISTOCRAT, *replica of Hotpoint's Millionth Range which set the standard of quality for 1942 models.*

Hotpoint Advertising and Sales Promotion for 1942 Employ New Ideas

HOTPOINT'S reputation for being out in front with new advertising and sales promotion slants to fit changing conditions is typified in plans for 1942. A big National Campaign in magazines with mass coverage, timely copy themes, and, of course, the new "Sauce for The Gander" movie program patterned after Hotpoint's sensationally successful "Blame It On Love" plan.

Hotpoint Features of Proved Quality for 1942

SELECT-A-HEAT CALROD units with 5 Measured Heats for 1942 embody the same quality and features that made Calrod famous.



FLAVOR-SEAL OVEN. Heating units in top as well as bottom of oven keep heat "in balance"—an exclusive electric range feature.

HOTPOINT AUTOMATIC TIMER CLOCK enables women to spend time in patriotic work outside the kitchen without neglecting meals.

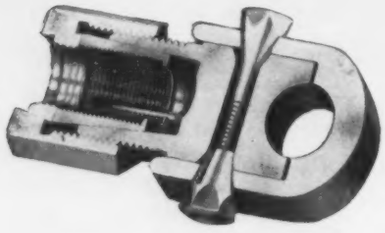
THRIFT COOKER converts low cost meats and tasty economy foods into healthful, delicious meals. Conserves electricity, too.

Visit Hotpoint Showrooms, 528 Furniture Mart, Chicago, January 5 to 17

Hotpoint ELECTRIC RANGES

REFRIGERATORS • WATER HEATERS • CLOTHES DRYERS • WASHERS AND IRONERS • AUTOMATIC DISHWASHERS • ELECTRASINK • STEEL KITCHEN CABINETS

Since time immemorial, the wedge has been the orthodox method of tightening and permanently joining two bodies together.



"Gorilla Grip" Mechanical Connectors use two types of this wedging principle to insure a mechanically as well as electrically perfect connection.

No special tools are required for any "Gorilla Grip" installation. The Connectors will not loosen after the connection is made and they may always be reclaimed for use again.

There is a "Gorilla Grip" Connector for every connection wherever it taps or terminates. Investigate, write for literature.

National Electric
PRODUCTS CORPORATION
1300 Fulton Bldg. Pittsburgh, Pa.

PRODUCTS
that are news

M & E Mark Aids (100)

To aid linemen, storekeepers and others who handle insulators in identifying various units, the Ohio Brass Co. is now marking the M & E strength on the cap of every 10-inch suspension insulator it manufactures.

These insulators have certain distinguishing features and vary widely in mechanical, electrical and thermal characteristics, but they are difficult to tell apart, the company states, because they all have a similarity in outside appearance. In addition to saving time in identifying insulators, the manufacturer claims that the new marking system will minimize the possibility of getting improperly rated insulators on a line, will enable users to check performance against ratings after the insulators have served for a number of years, and will help in salvaging insulators for reuse should a transmission line be moved or altered. The markings are the catalogued M & E strength ratings and represent the minimum strengths of the 9,000, 11,000, 15,000, 25,000 and 36,000-lb. suspension insulators on which they are used. The figures are formed in the caps during the casting process and therefore are a permanent part of the insulators.

Outdoor Transformer (101)

A new outdoor potential transformer for 2300 volts and below has been announced by the meter division of General Electric Co. Designated type JE-3, the new transformer is especially suitable for accurate metering service. According to the company, it supersedes the type JE-36 but retains the same dimensions so that the two are interchangeable. Accuracy ratio and phase-angle characteristics also remain unchanged. Insulation of the JE-3 has been improved. In the 2300 115-volt rating the new transformer's insulation is sufficient to meet the impulse test requirements of a 60-Kv. full-wave, which is the A.S.A. standard for 5-Kv. instrument transformers. Ratings below 2300 volts meet the impulse test requirements of a 50-Kv. full-wave. Accuracy classification of the JE-3 is ¼W, ¼X, ½Y. It is rated 200-volt amps. and is compensated for correct ratio at 50-volt amps. It will carry 300-volt amp. continuously on a thermal basis without overheating. The JE-3 is housed in a cylindrical seam-welded casing of copper-bearing steel. Primary and secondary terminals are flexible leads brought out through bushings in the bottom of the transformers. The bushings for the secondary leads are so arranged that they can be removed and replaced by standard conduit fittings. Core and coils are thoroughly impregnated and coated with an asphalt compound to make them impervious to moisture.

F Improvements (102)

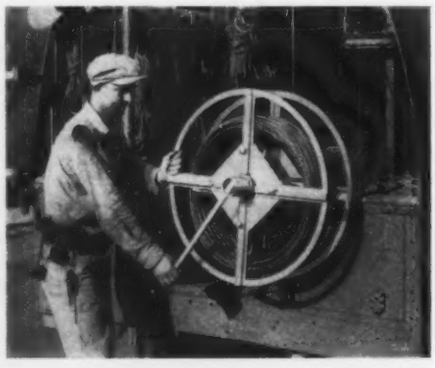
Setchell Carlson, Inc., has developed several fluorescent fixtures which, the manufacturer claims, combine instant starting, high-power factor, elimination of starter plugs, relays, correctors, condensers. Using incandescent lamps for ballast, these fixtures convert into light all current consumed. The incandescent light is directed to the ceiling as indirect light. Several models are available, from those using two 40-watt fluorescent and two 40-watt incandescent, to kitchen units of smaller size.

Ace Light Control (103)

F. W. Wakefield Brass Co. have a new fluorescent lighting unit known as the Ace, which features direct distribution of light, approximately 90 percent downward, which can be interconnected on factory order, to form continuous luminaires. A unit A-448 Ace has four 40-watt lamps 17½ in. in width, length 49 in. and a standard suspension of 30 in. Voltage operation is 110-60 a.c. The A-648 Ace employs six 40-watt lamps, is 26 in. in width, with a length of 49 in. and a standard suspension of 30 in. This unit has the same voltage requirements.

Adjustable Cable Reel (104)

A new adjustable cable reel has been developed by the Line Material Co. which assures smooth pull-off because of several new basic features built into the reel. The reel expands to a snug fit against the inside of the coil, holds the coil firm, eliminating loose flopping and jerky turning common to



older type reels. A braking action provides enough drag to prevent the reel from continuing to turn after the lineman has stopped pulling the wire, and as the new reel swings on a hinge from the rear of the truck in a full 90-deg. arc, there is said to be no need to lift or move the reel in order to pull wire in the desired direction.

New Horizons are coming into focus fast!

Anaconda quickens search for better wires and cables for American Industry and Defense

America is moving ahead at a faster pace. New industrial horizons are being reached and passed daily . . . thanks to the ingenuity of private research.

In the laboratories of the Anaconda Wire & Cable Company, for example, engineers are building longer life, greater current capacities, greater dependability in the power lines supplying electrical energy to vital defense machinery. But even when our defense goal is achieved, research will be looking further ahead . . .

Tomorrow when peace comes, Anaconda Wire & Cable Company will be ready with not only many new products, but also many product improvements for those who have been denied them during the emergency period. There will be better wires and cables available for a better and greater era of industrial progress.

ANACONDA WIRE & CABLE COMPANY
General Offices: 25 Broadway, New York City
Chicago Office: 20 North Wacker Drive
Subsidiary of Anaconda Copper Mining Company
Sales Offices in Principal Cities 41379

ANACONDA
from mine to consumer

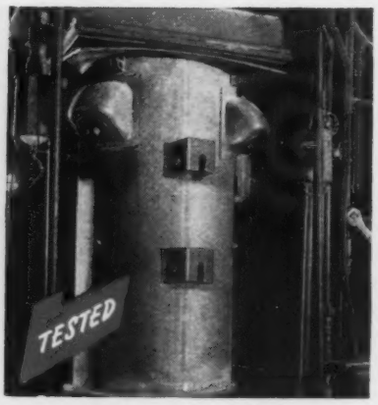
This familiar trademark identifies Anaconda products. It symbolizes the best efforts of man and science.

ELECTRICAL WIRES AND CABLES OF COPPER ARE THE LIFE LINES OF OUR NATION

ANACONDA WIRE AND CABLE

REASONS WHY ENGINEERS CHOOSE THE NEW

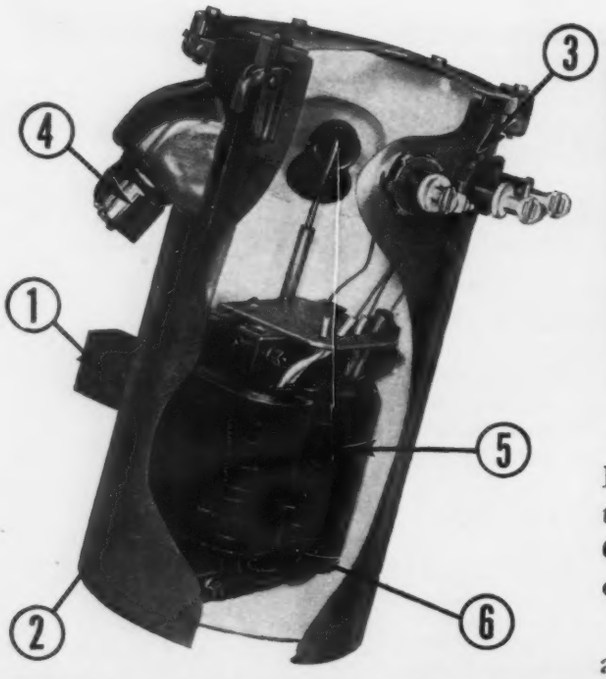
1 Simplified Supports for Direct Pole Mounting Cut Installation Time. Standard Support Spacing and Bushing Location Mean Complete Interchangeability of All Sizes and Makes.



2 New, Durable, Copper-Bearing Steel Tanks. Tested Under Pressures Far Greater than Normal . . . Prevent Oil Leakage, Assure Long Life and Complete Safety.

3 New Spra-bonderizing Process . . . Plus Triple Coat Automobile Finish Give Tanks Positive Four-way Protection Against Attacks of Rust and Corrosion.

"Money-Saving



"YES! And There's a Lot More to this New, Easily-Installed Allis-Chalmers Distribution Transformer . . . with Its Six Big Engineering Features!"

If that's what *you* are looking for in the distribution transformers you buy, you'll *find* it in the new Allis-Chalmers Distribution Transformer with six big engineering features!

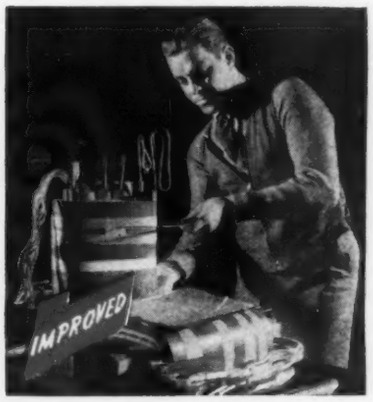
Here's a transformer design that's based on the actual field experience of hundreds of operating men

ALLIS-CHALMERS DISTRIBUTION

ALLIS-CHALMERS DISTRIBUTION TRANSFORMER

4 Extra-heavy Porcelain Coordinated Bushings with Liberal Creepage Offer Maximum Reliability Under Fog, Dust, Chemical or Other Adverse Conditions.

5 Double Conductor Insulation... Flexible Enameled Wire... Plus the Added Protection of Well-Lapped Cable Paper Provide Double Safety Against Winding Failures.



6 Improved Core and Coils, Liberally Designed with No Manufacturing Short Cuts . . . Mean Extra Years of Service-free Performance Under All Types of Operating Demands.

Operation?"

all over the country . . . a transformer that makes your specifying and buying easier . . . saves you both time and money!

Because the location of supports and bushings are standardized, all sizes and makes are completely interchangeable. Deliveries are faster . . . installation easier . . . there are fewer parts and fewer complete units for you to handle in stock.

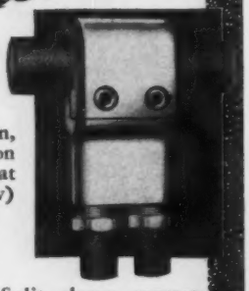
But that's only part of the story! Look at the photographs across the top of the page. They tell why you get a *plus* value when you get the new Allis-Chalmers Distribution Transformer. Advanced engineering . . . plus the best material and skilled workmanship . . . give you built-in quality second to none!

Bulletin B-6159 gives complete engineering information on the new Allis-Chalmers EEI-NEMA Distribution Transformer. Write for your copy . . . *today!* Allis-Chalmers Mfg. Co., Milwaukee, Wis.

A-1407

TRANSFORMERS *Cut Operating Costs*

The MOST COMPLETE
LINE OF
Tee Connectors



ALL good types —any size.

With a *hinged clamp* for the main, the Penn-Union Type HFM (at right, and below) is easy to apply.

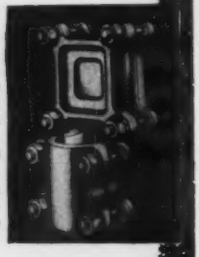
Split sleeve contact unit gives permanent grip on branch.

Made for single or multiple branch connections.

ALSO CABLE TAPS — a complete line of 90° and Parallel taps, for one or more branches.

COMPACT and POSITIVE. The Penn-Union Type SM gives equal tightening on the run and tap. Self-locking, dependable.

CLAMP TYPE TEES for all sizes of tubing and cable—a full line. Machined contact surfaces.



MANY MORE TYPES—for all combinations. For connecting flat bar, run or tap, to tubing or cable. Also "general utility" tees that take a wide range of conductor sizes. You will find that the Penn-Union line has *exactly what you need.*

FOR ANY CONDUCTOR FITTING—Terminals, Service Connectors, Studs, Two-Ways, Ground Clamps—see the THOUSANDS in the Penn-Union Catalog.

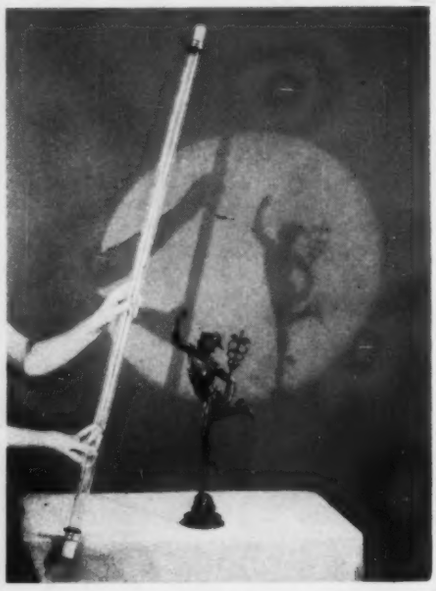
Preferred by the largest users, who have found that *Penn-Union on a fitting is the best guarantee of Dependability.*

KENNETH ANDERSON CO.
2115 So. San Pedro St., Los Angeles
NORTHWESTERN AGENCIES
2411 First Ave., Seattle, Washington
F. M. NICHOLAS CO.
1123 Harrison St., San Francisco
Penn-Union Electric Corp., Erie, Pa.

PENN-UNION
Conductor Fittings

Mercury Giant (105)

The largest and most powerful mercury lamp in the world has been announced by G-E and Westinghouse. Rated at 120,000 lumens, the long tubular light source is 8 times more powerful than the present largest lamp of its kind. The 55-in. length of the unit is only 4 times that of its nearest rival, a 400-watt mercury lamp rated at 16,000 lumens, which is in use at many factories at the present time. The manufacturers believe the lamp will be especially serviceable in the lighting of large industrial plants where high mounting heights of luminaires are required. Trial installations have shown that the



mercury tubes, in adequate reflectors and on a conventional spacing center, provide more than 50 ft.-candles evenly over the working plane. An additional advantage claimed for this high-power lamp is that reflector and transformer equipment required for operation of a single unit is considerably less costly than the aggregate equipment needed to produce the same amount of light from a system of 8 or 9 400-watt mercury tubes in separate fixtures. Also, the servicing of a single unit would be more economical.

Resistor Kits (106)

Assortments of IRC resistors in metal cabinets for the convenience of engineering laboratories, factory maintenance departments and service men have been introduced by the International Resistance Co. According to the company, three standard assortments are available, the first of which includes 59 resistors including ½-watt and 1-watt type BT metallized resistors as well as type AB (fixed) and type ABA (adjustable) power wire wound resistors. The second assortment includes 100 type BT-½ (½-watt) insulated metallized resistors in 28 ranges from 50 ohms to 2.0 megohms. The third assortment contains 83 type-BT-1 (1-watt) insulated metallized resistors, also covering 28 ranges.

T-Connector (107)

A high copper alloy multigraph type T-connector for tubing, run and tap is featured in a release by the Burndy Engineering Co., Inc. According to the manufacturer, this connector effectively combines the function of T-connector and coupler at a single point.

TIPS TOOLS

keep high voltage circuits alive . . .

Whether or not your service extends to defense plants, it plays a vital part in making America strong. Other industries and civilian needs are important, too. See to it that maintenance crews are properly equipped to make line repairs in safety without interrupting service. See to it that linemen know the right methods to use, and make it a point to be sure that the tools on hand are the best, safest, simplest, and easiest tools on the market to use. Do this, and your maintenance crews will use Tips Tools—still available without delays, at NO INCREASE IN PRICES.

CONSULT THIS BOOK

A·B·CHANCE CO. CENTRALIA MISSOURI

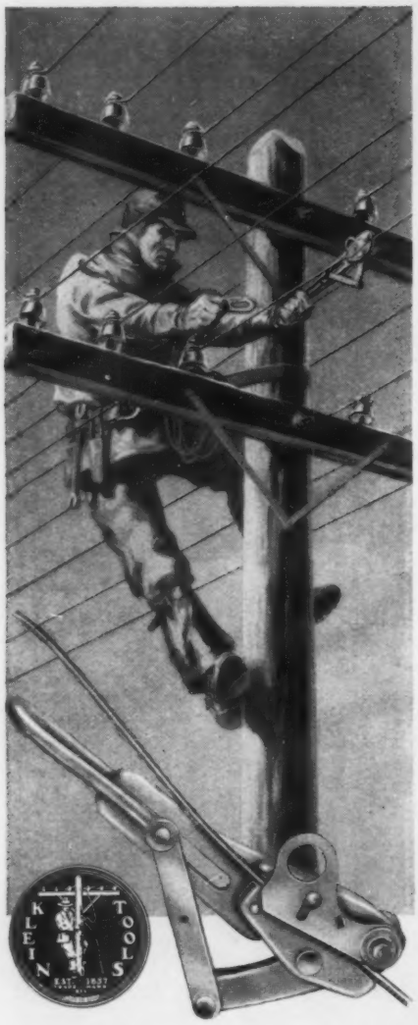
CONSERVE RUBBER

Use PAPER or VARNISHED CAMBRIC

Serve the Nation's interests by conservation of all vital materials. Rubber is extremely vital to all branches of the Service.

GENERAL CABLE CORPORATION

TOOLS
HE CAN TRUST



WHEN you are up on a pole—with fifty feet of air between you and the ground—that's when quality in equipment counts—when the quality of the job you do—your safety—your life itself depends upon the tools and equipment you use. It's on the basis of quality and safety first that public utilities—large industrial plants—skilled workmen everywhere—have chosen Kleins as their standard—since 1857.

Your copy of the Klein Pocket Tool Guide will be sent on request.

ASK YOUR SUPPLIER

Foreign Distributor:
International Standard Electric Corp., New York

Mathias **KLEIN** & Sons
Established 1857 Chicago, Ill. U.S.A.
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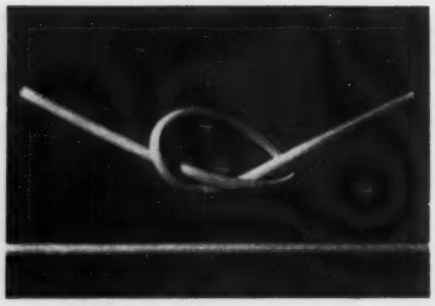

Fibrous Glass Sleeving (108)

A new development in fibrous glass varnish sleeving is announced by Wm. Brand & Co., in which the glass braid is processed with natural oil base varnish, immediate results of which, according to exhaustive comparative tests, greatly enhance dielectric values. Such process, it is claimed, not only provides higher dielectric constants, but obtains a greater degree of flexibility, while the stretch factor is reduced to a practical minimum by which there is insured greater stability and more permanent value under the various applications involving bending at the more acute angles. A special feature of Turbo glass is claimed to be a precisely-rounded product whereby objectionable circumferential wrinkles and gaps are eliminated. This type of glass varnish sleeving is made available by the company in two grades, in all standard diameters established in the regular line of Turbo flexible varnish cotton tubing.

Crosley Winners (109)

The new Crosley refrigerator line features 7 models, one 6-ft. model, four 7-ft. models and two 9-ft. models featuring stainless steel trim surrounding the entire food compartment; plate glass shelves for visibility of food stored on all shelves; frozen food com-

partments; "electrosaver" sealed unit in which motor, compressor, and lifetime supply of oil are sealed in a steel, sealed-in steel. The electrosaver control is a 10-point temperature regulator. The door of the refrigerator contains 3 in. of insulation and the door-liner is made of plastic.

Louver Type F Unit (110)

Day-Brite Lighting Inc. has a louver type exposed troffer fluorescent fixture for direct ceiling mounting, designed for single unit installations and long continuous runs. These units are available for one and two 48-in. 40-watt lamps parallel and for 60-in. 100-watt lamps.

STRENGTH, ruggedness and durability are combined with definite economy in *Crapo* Galvanized Steel Strand. Low first cost, low maintenance expense are matters of record wherever this time-tested product is in use. Available in all standard grades and sizes from representative jobbers throughout the country. Or, write—

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INSULATED TOOLS

Reduce accidents
and service interruptions

No. 60 Hacksaw Frame

List Price $11.25

Strong, light weight steel frame, heat treated and tempered to prevent set. Takes any standard 12" blade. COHARDITE insulation solidly molded on the frame and tested to 20,000 volts R.M.S. Shape of frame makes it particularly valuable for underground work or in other confined spaces.

Every tool tested to its full rated dielectric strength for one minute R.M.S. before it leaves our plant.

A full range of COHARDITE insulated small tools carried in stock for Meter and Distribution Departments.

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The Connecticut Hard Rubber Co.
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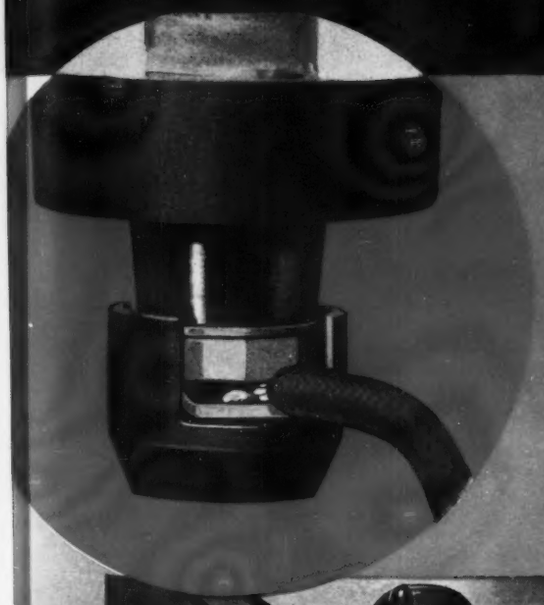
No Feeder Lock-outs or Phase Grounding

with L-M Lightning Arresters



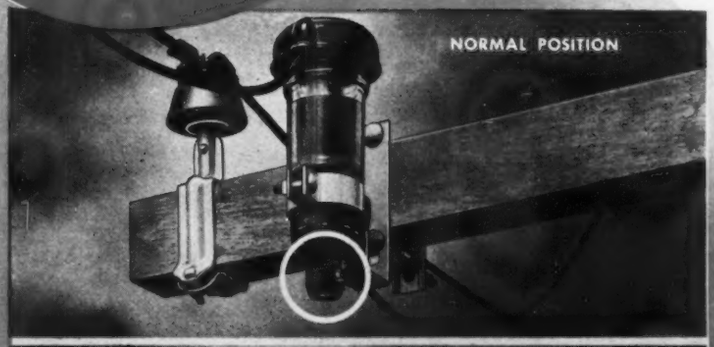
In a good Lightning Arrester you expect these important features:

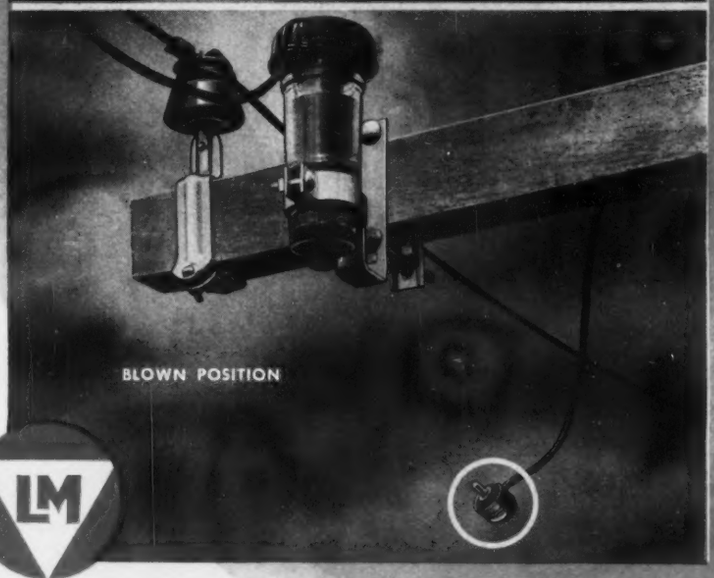
High surge capacity.
Low IZ drop.
Positive moisture proofing.
Permanence of valve material characteristics.
Visual-inspection glass housings.

L-M Lightning Arresters give you all these

plus the ISOLATOR*

WHAT THE ISOLATOR IS: The ISOLATOR, located at the base of every L-M Arrester is a positive circuit disconnecting device activated by heat.





HOW THE ISOLATOR WORKS: Surges within the capacity of the L-M Arrester are carried to the ground in the normal manner with no effect on the ISOLATOR.

Should an L-M Arrester ever become damaged by an abnormal surge, the continued flow of follow current to ground causes the ISOLATOR to operate instantly, rupturing the ISOLATOR housing and throwing the ground lead clear — thus avoiding any chance of a permanently grounded feeder.

IN ADDITION, the ISOLATOR, when in blown position, serves as a positive indication of a damaged Arrester, easily visible from the ground. This permits a damaged Arrester to be located quickly and easily for replacement.

THE ISOLATOR is fool-proof and safe. When it operates no parts are thrown to the ground, and it can only operate under the conditions described. The ISOLATOR is mechanically strong and cannot be damaged by ordinary handling.

Any Lightning Arrester might fail at some time during service. With an L-M Arrester you can be sure that after being damaged it cannot lock-out a feeder or result in phase grounding. Too, any damage to the Arrester is indicated by the ISOLATOR.

For detailed explanation of the ISOLATOR and other features of L-M Lightning Arresters write us, or ask your L-M salesman, for L-M Bulletin 40151.

*An exclusive L-M feature. Patent Pending.

LINE MATERIAL COMPANY

And there's just as much difference between the *streamlined* BRIEGEL METHOD of making connections and former old-fashioned methods.

The BRIEGEL METHOD saves you up to 50% on time and a substantial saving on materials, allowing you a larger margin of profit on each job. Make quick, easy, strong and neat connections this MODERN way.

No extra turns or twists, no nuts to tighten when you use B-M connectors and couplings. Just TWO SQUEEZES with the patented B-M indenter (which costs you only $1.25) and you have a smooth efficient job. Approved by Underwriters Laboratories.

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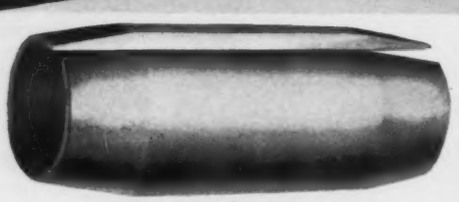
SPLIT-TINNED COPPER CONNECTORS



(Made to N. E. L. A. Specifications)

They are manufactured exact to size from the best grade of commercially pure soft copper. Split the entire length they permit the hot solder to flow smoothly and evenly around the cable. Tin coating assures ease in soldering. They have a guaranteed high conductivity. Carried in a size range from 12B & S solid to 2,500,000 C.M. Order from your jobber today.

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International Standard Electric Corp., New York, N. Y.

Meter Protector (111)

Reduction of lighting damage to watthour meters, electric ranges, and other appliances connected to 120/240-volt exposed secondary circuits, is claimed for a new meter protector announced by Westinghouse Electric & Mfg. Co. Known as type AO, the protector is a 2-pole porous block lightning arrestor with a 175-volt line-to-ground rating and a 240-volt line-to-line rating. Gap breakdown on 60 cycle circuits is 800 volts r.m.s., and gap breakdown on impulse is 2000 volts crest. Discharge capacity is 10,000 lightning surges amperes. Protector elements consist of a 1-in. diameter porous block with a series gap of flat electrodes, separated by a mica spacer and held in firm contact by a spring plate. The two single arrestor elements are mounted in a housing of Prestite, a new high grade porcelain impervious to moisture. A mounting plate is the common connection for the two poles and when installed, is grounded. Porcelain and coverplate mount with two screws in any standard condulet. Assembly is then covered with a gasket-sealed cover for outdoor service and a non-gasket cover for indoor service. The condulet is located above or below a meter, and each pole of the arrestor is connected to the "hot" wires. The common connection point, the mounting plate, of the protector is grounded to the neutral of the circuit and this method of connection causes the lightning surges to discharge to the ground neutral wire and avoids damaging the current and potential coils.

F Lamp Resistor (112)

Ward Leonard Electric Co. have a fluorescent lamp resistor for use with 6-watt T-5 fluorescent lamps on either alternating or direct current with a manual momentary contact starting switch. When operating these lamps on 120-volt circuits, these resistors eliminate the need of an auxiliary, according to the manufacturer. The K-40878 resistor unit measures approximately 1¾ in. x 6-12/ in. overall, can be mounted in any standard fixture or wiring trough, and is insulated for 15,000 volts to ground.

Enclosed F Units (113)

Markel Electric Products, Inc. have developed a line of fluorescent fixtures totally enclosed in glass providing light emanation in all four directions. A complete review of this line is offered in a catalog issued by this company pictorially presenting the units and describing their specifications and operating requirements.

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THE THREE STICKS...

A CHINESE proverb tells of the wisdom of a father, who sending his three sons into the world, handed them a single stick to break. Each broke it with ease. He then handed them three small sticks but although the combined diameter of the three did not exceed the diameter of the large one, neither could snap them together. Moral: stick together boys.

And the same principle applies to a forging. The many tough fibers that make up its grain structure gives stronger, lighter hi-line hardware.

THE BREWER-TITCHENER CORPORATION
Cortland, New York

LITTLE LESSONS IN FORGING

The illustration shows both the male and female die, used in forging insulator caps. In forging these caps three steps are necessary; gathering the stock in the rolling impression, blanking out and forging to shape. These shapes are easily seen on the illustration of the dies. All three steps are accomplished in one heating.

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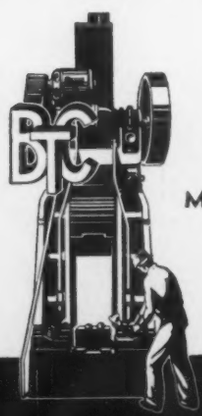
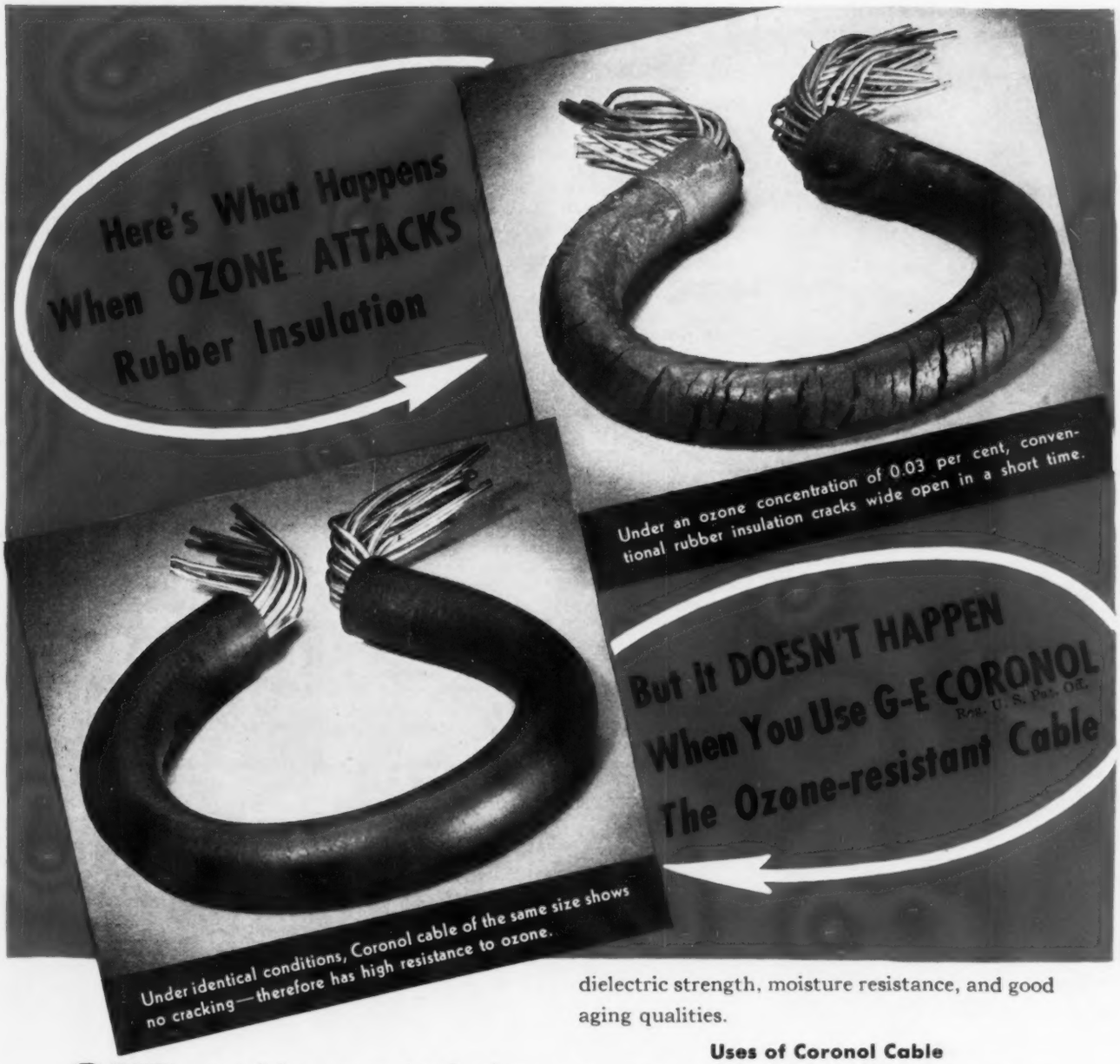
A fully illustrated booklet outlining the history of forging sent free on request as long as the supply lasts.

FORGERS OF HI-LINE HARDWARE



THROUGH YOUR INSULATOR MANUFACTURER ONLY

YOU KNOW WITH A FORGING


Here's What Happens When OZONE ATTACKS Rubber Insulation
Under an ozone concentration of 0.03 per cent, conventional rubber insulation cracks wide open in a short time.
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Under identical conditions, Coronol cable of the same size shows no cracking—therefore has high resistance to ozone.

OZONE, created by corona, breaks down ordinary rubber compounds. If such compounds were made up for ozone resistance alone, they might well be lacking in the other good qualities that are necessary. Achieving ozone resistance at no sacrifice of strength in other qualities is one of General Electric's accomplishments in the art and science of compounding. Coronol is an oil-base compound developed by General Electric to provide ozone resistance in *combination* with other good properties such as dielectric strength, moisture resistance, and good aging qualities.

Uses of Coronol Cable

Coronol cable applies in general to the voltage range for rubber-insulated cable. Use it for station, generator, and station auxiliary leads, aerial cable, and nonleaded underground cable. For information on Coronol or any other power and control cables, consult the nearest G-E office, or write General Electric, Schenectady, New York.

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STANDARD HANDBOOK FOR ELECTRICAL ENGINEERS, McGraw-Hill Book Co., $8.00. This is a new edition of the classic electrical engineering encyclopoedia by Archer Knowlton, and R. M. Shoop. The book has been rewritten and now is of standard book size, larger than the "pocket" dimensions of previous editions. However, it follows the pattern set in the past closely enough so that users will not find a wholly unfamiliar manual in their hands. In its 26 sections are combined the works of 102 authors, most of them new to the book and each an authority in his special field. The whole is correlated and organized in the intention to present in compact form what the editor-in-chief terms primarily "an encyclopaedia of applicable information and secondarily an epitome of the academics of electrical phenomena." Inspection of the book appears to bear out this editorial intention, for, while the fundamentals of electrical engineering are by no means neglected, conspicuously to be noted are today's conditions, as reflected in new problems of applications and operations, in later developments of equipment, devices and in the past 10 years of progress in the electrical arts. Recognition is given to such typical modern developments as air conditioning, electricity in aviation and in the petroleum industry, lighting technology, high-voltage generators and cyclotrons. Outstanding among the many thoroughly revised sections is one of particular value, that of "Codes and Standard Practices," which now contains about 1,000 listings of published specifications and prescribed practices and the sources from which they may be obtained.

☆

ENGINEERING ELECTRICITY by Ralph G. Hudson, 284 pages, 5x7¾, 236 Figs., flexible cover, $3.00, John Wiley & Sons, N. Y., is a compact general introductory text. It is an excellent combination of description of apparatus and precise theory.

Some 75 photographic illustrations show many common electrical machines and materials. The 269 diagrammatic figures complete the pictorial presentation. The illustrations and descriptions of apparatus are up to date. They show both interior and exterior views of cable, instruments, motors, transmission equipment, rectifiers, etc.

Long mathematical developments are omitted but many vector diagrams and equations are provided. Perhaps the outstanding feature of this book is the completeness of the presentation of the vectorial and algebraic relationships of the circuits. These are sufficiently complete to be valuable for reference or review for almost any electrical engineer. A knowledge of calculus is evidently expected of the student. The analytical part of the book is more nearly complete than is ordinarily found in a book containing so much easily read general descriptive matter.

Several chapters of this book, for example, "Alternating-Current Circuits," are very pleasing and concise and. for an introductory work, quite complete. The new chapter on "Electronic Theory and Applications" is brief but highly informative.

There are 218 practice problems, with answers grouped in the back of the book according to chapters. This book is a credit to the collection of works by Professor Hudson, and, like his others, is compact and comprehensive. It is a book that most students should enjoy using.

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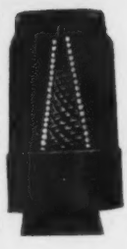

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Operating men who saved many dollars during normal times by salvaging wire from the scrap heap, and then making it usable by splicing with Kearney ABC Rolling Machines and ABC Sleeves — now can conserve their conductor supplies by the same practical methods. Today, more than ever, it pays to use Kearney ABC Rolling Machines and ABC Sleeves—to obtain money from the scrap heap, conserve copper wire and save defense metal.

A Kearney Representative can show you advantages of the Kearney ABC methods of splicing wire . . . He can show you how you get a good, uniform joint every time, from any lineman in your crew. Or, if you like, write direct for further information.

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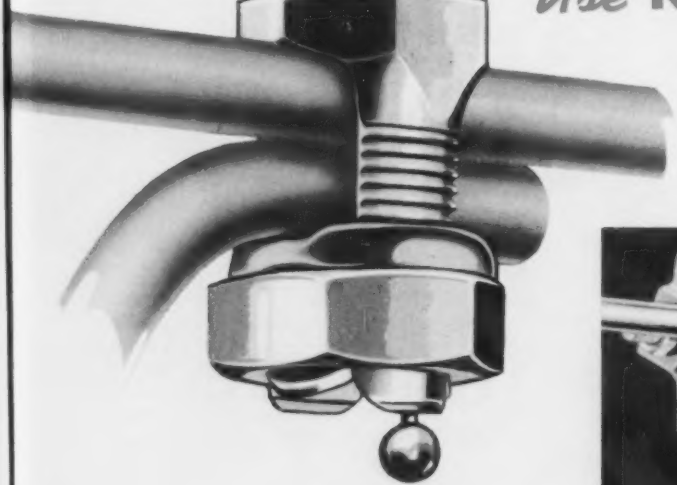

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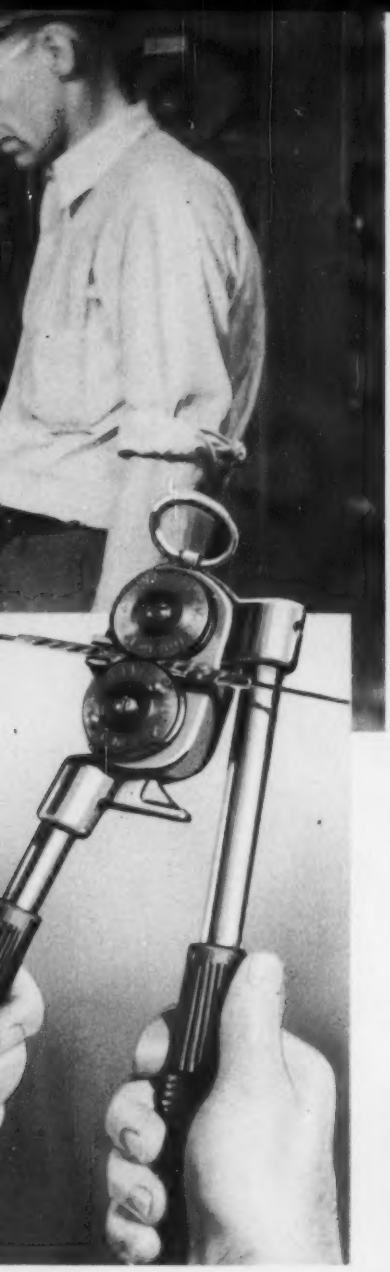

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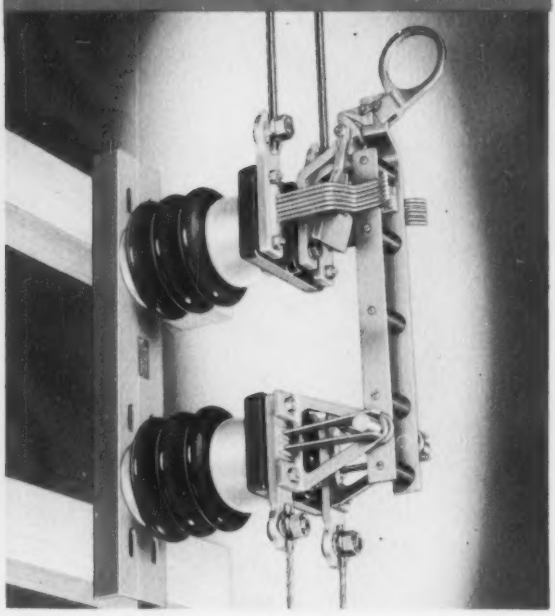

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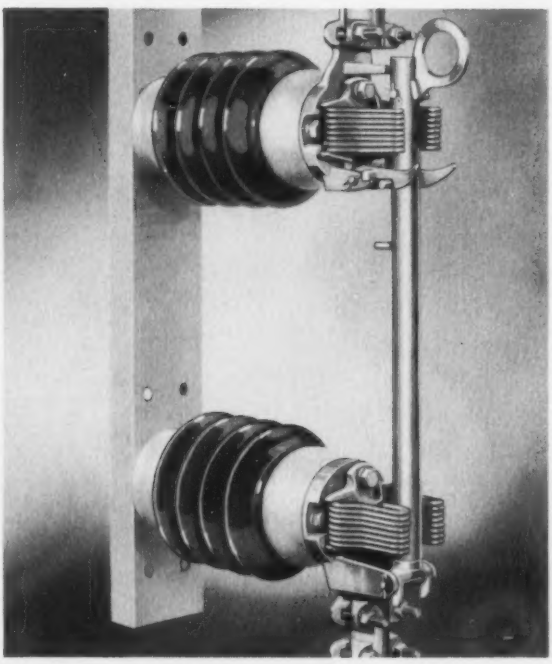
Kearney By-Pass Disconnect Switches are now used in important substations, to take regulators out of service, to safely isolate metering equipment and to safeguard men.



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With greater flexibility in power systems becoming more important than ever, Kearney Hook Operated Disconnect Switches, in various ratings and styles, including the above, are used to satisfy requirements.

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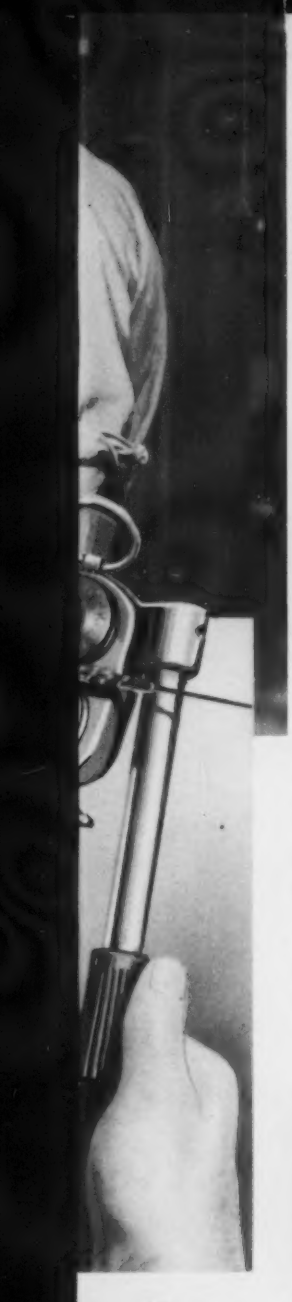

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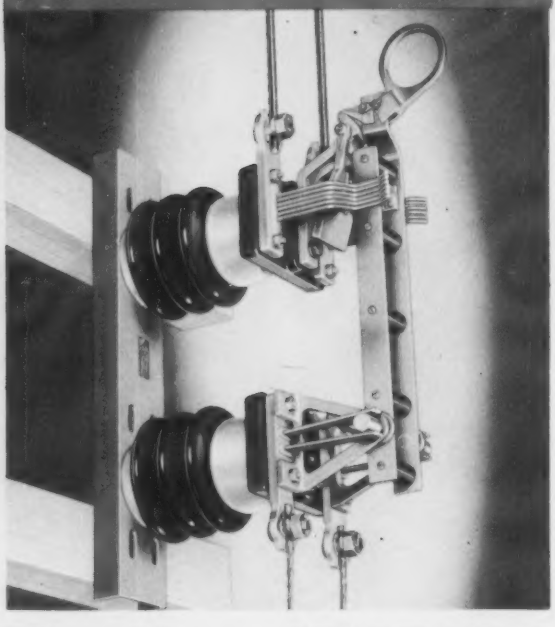

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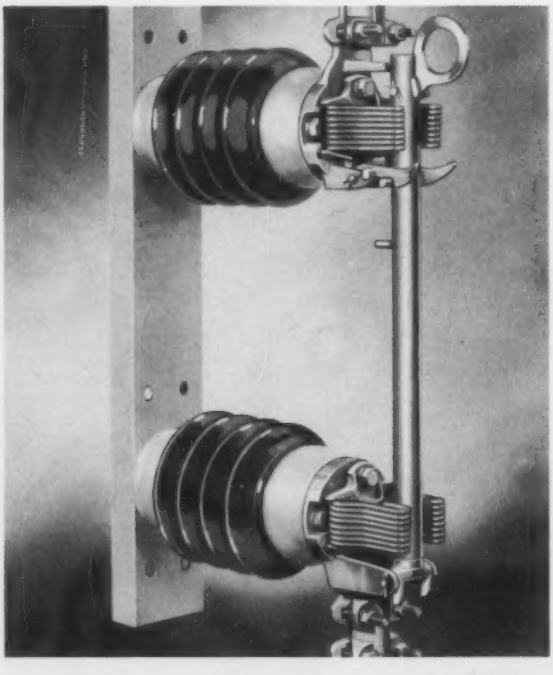

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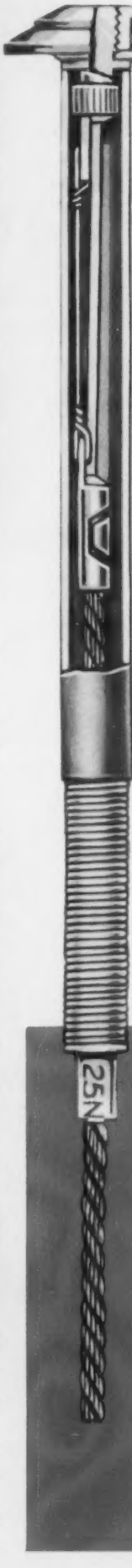

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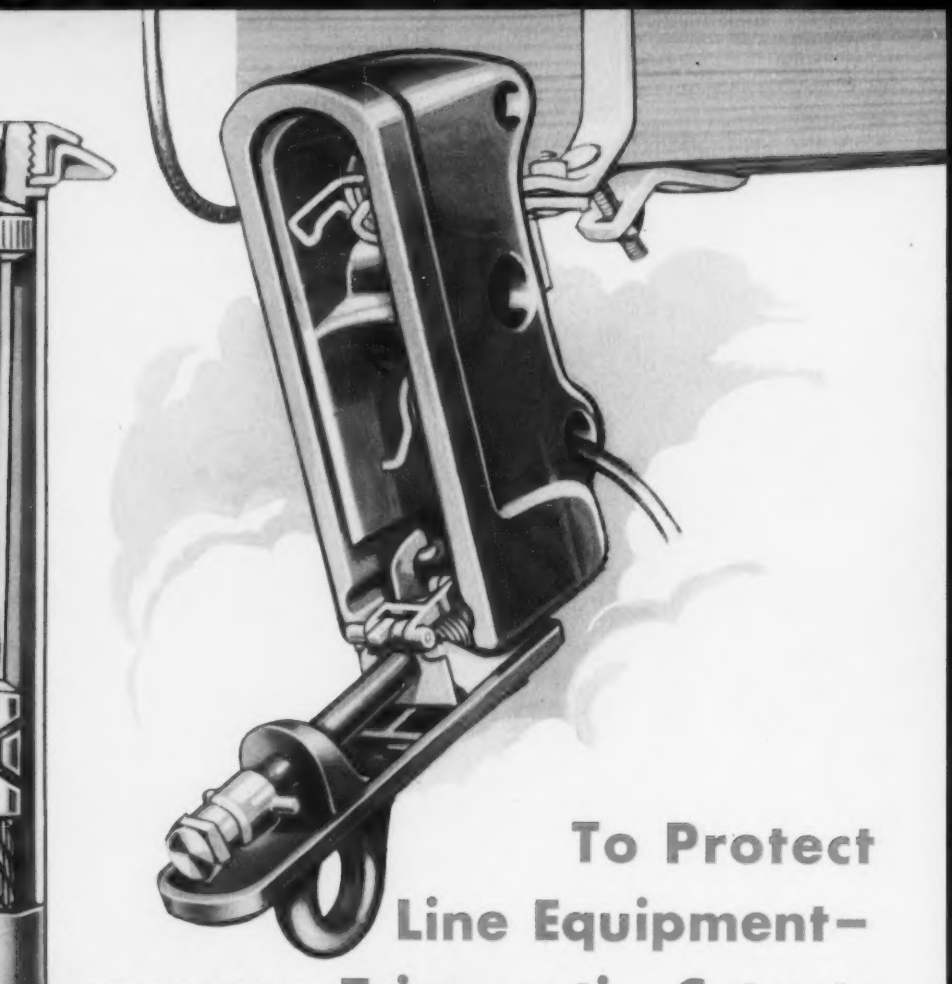

To Protect Line Equipment—

KEARNEY Tripomatic Cutouts

It is estimated that the thousands of Kearney Tripomatics which have been in service as long as six years have reduced losses by avoiding unnecessary service interruptions and damage to equipment by a savings, over unprotected systems, amounting to more than 20% . . . Good reason, you'll agree, to consider the use of Kearney Tripomatic Fuse Cutouts for protection of the increased loads of today. Tripomatics are available for 5000 and 75001/2500 Y., 50 and 100 amps. And there's a 5000 volt, 50 amp., Heavy Duty non-indicating Tripomatic.

Avoid Unnecessary Outages with Modern KEARNEY FUSE LINKS

Recognizing the urgent necessity of providing fuse links which will avoid unnecessary outages on lines protected with modern Fuse Switches and Cutouts, the Kearney Corporation offers a line of improved fuse links that have accurate, low temperature, pure tin fusible elements which carry normal loads safely and likewise isolate faults promptly.

These are the dual-purpose fuse links which operating men throughout the country are using in Kearney Trip Out, Trip-O-Matic and Trip-Saver Switches and in other conventional cutouts, too.

Really, since they cost no more, you should take advantage of the sure protection which these precision-built Kearney Fuse Links provide. And remember, Kearney Fuse Links come packed in handy Pul-Tab Fuse Paks, 5 links to a Pak, 25 links in a sturdy, easy-to-handle square cardboard carton.

CTS-

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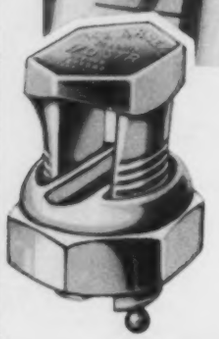


AT SERVICE ENTRANCES good, permanent connections are made with modern Kearney Con-Nec-Tites. Disconnecting of the connection is merely a matter of loosening the connector nuts, a most convenient and a practical time-saving feature to be considered now.

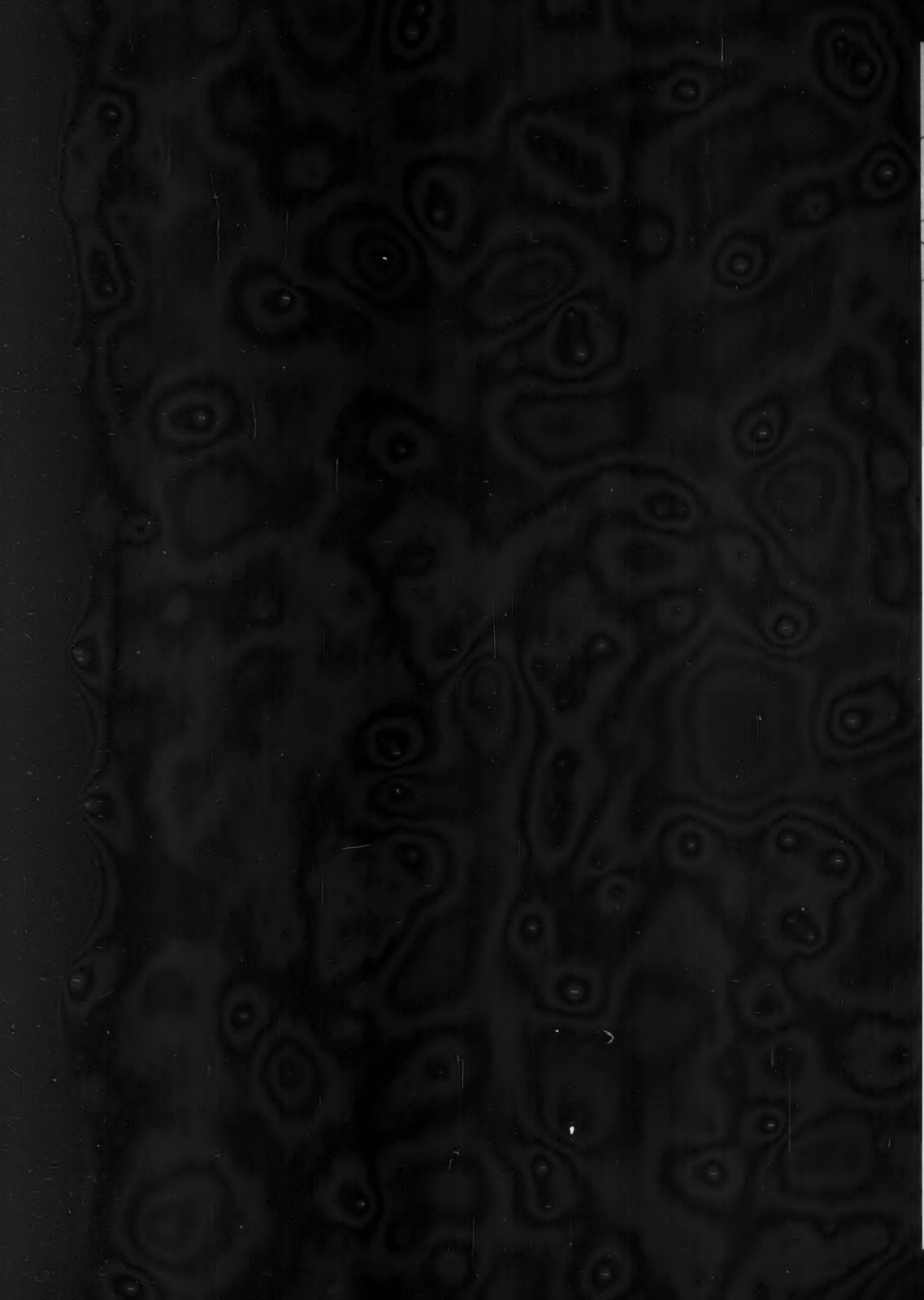
A FEATURE of Kearney Con-Nec-Tites are the patented full round washers which afford a smooth, low-friction bearing service for the nut and permit maximum, tight pressure to be exerted between conductors.

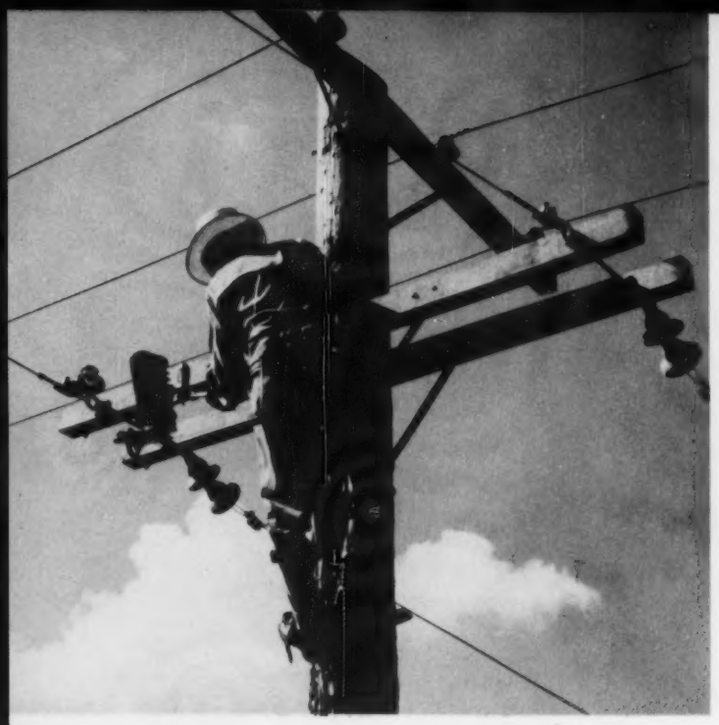
FOR CONNECTING ALL TAPS, fuse switches, lightning arresters, jumpers, etc., modern Kearney Con-Nec-Tap Clamps are used—conveniently installed with a Kearney Clampstick, as shown.

KEARNEY FUSE LINKS are definitely a precision unit, and are made by skilled and experienced workers under careful supervision; meeting required standards.

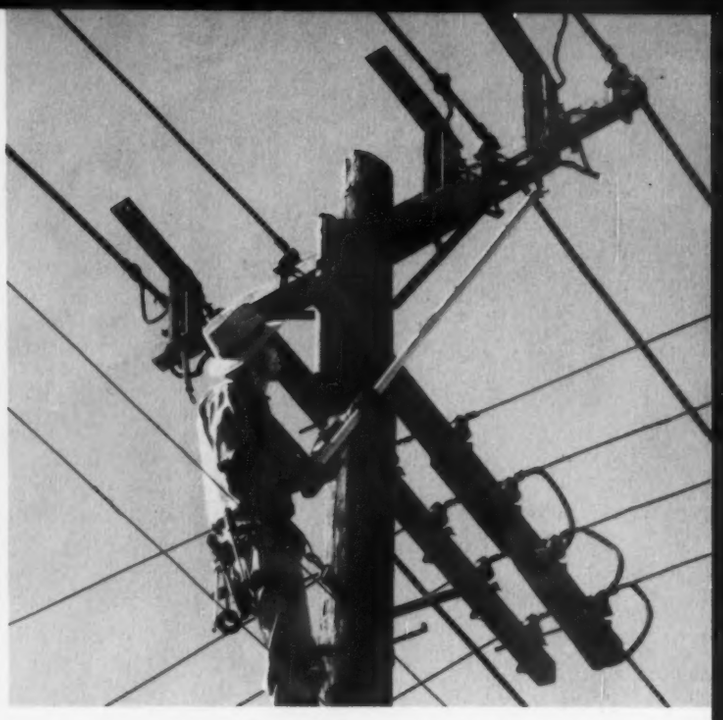
TROUBLE SHOOTERS show preference for new Kearney Fuse Links. Pul-Tab Fuse Paks contain five links. Each link is in an individual bag with a "pul-tab" to permit quick access to a link and show the amperage rating. Cartons contain five Fuse Paks, a total of twenty-five links. Easy to store, easy to dispense, easy to identify, no tangles or waste. And by using Kearney Fuse Dispensing Boxes on poles, you can always keep the right fuse, in the right place, at the right time.

Page for Further Information





PROTECTING MAIN CIRCUITS against faults which might occur on branch lines can be readily accomplished by installation of Kearney Tripomatic Fuse Cutouts, as here shown, at the junction. The cutout door "trips-out" to clearly indicate an outage.



AT SECTIONALIZING POINTS on urban constructions, such as illustrated above, you will find that modern Kearney 400 ampere Porcelain Housed Switches may be efficiently used to afford positive flexibility of operation for maximum continuity of electric service.

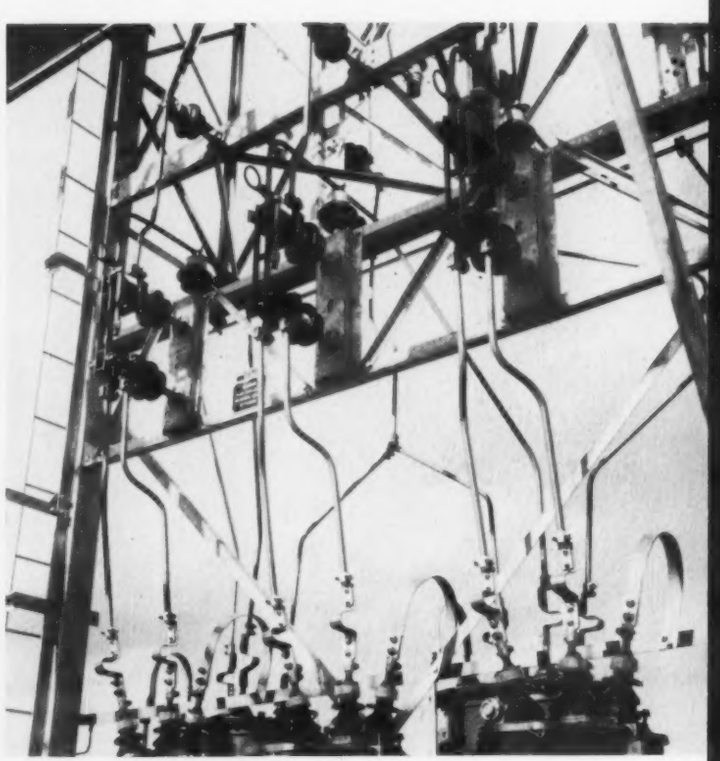
These Products that Protected Revenues — now are Used to Protect Vital Power Supplies

NOT SO LONG AGO, operating men saw to it that lines serving good customers were amply protected with products, such as shown here, which would assure greater continuity of customer service . . . That was good business, then . . . It's good business anytime, to protect a source of revenue.

Today—Kearney Products are used for an additional phase of protection—the protection of lines serving America's No. 1 customer — the defense industries, Army and Navy projects . . . And this, too, is good business.

And to serve your customers better, whether in times of defense or peace, you'll find that it pays to specify dependable, fully guaranteed Kearney Equipment. Without hesitation, order switches, connectors, anchors and pole line accessories or Kearney Live Line Tools, and know that you are specifying products that operating men from coast to coast heartily recommend.

Any Kearney Representative will be glad to show you samples of many products, and work with you in the selection of particular equipment for particular jobs . . . Or, just write for further information and prices.



ON REGULATOR INSTALLATIONS structure space requirements can be condensed by installing Kearney Regulator By-Pass Disconnect Switches: available in ratings: 7500-750 v., 100, 200, 400 and 600 amps; 15,000-1500 v., 200, 400 and 600 amps.

See Reverse Side of this

s.
of
d
v.
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w-
n,
s.

Picture D Story!

BEFORE the West Penn Power Company modernized this panel, located on its property in New Kensington, it presented the picture shown at the left. A fusible type panel, it provided 12 lighting and power circuits. It was obsolete and overloaded. Increased capacity was needed.

AFTER installing the new Multi-breaker panelboard, in the same box and using the same conduit. An increase in circuits from 12 to 20—66⅔% more capacity. An easy, economical transformation.

West Penn is one of many Power Companies throughout the country which not only promotes Multi-breaker equipment but uses it to advantage.

FACT: Multi-breaker lighting and distribution panels, when installed in existing panel boxes, usually increase the number of circuits by more than 50% and provide circuit breaker protection. Thus, they solve a problem which exists in scores of commercial and industrial buildings.

MULTI-BREAKERS ARE NON-TAMPERABLE

CALL IN A

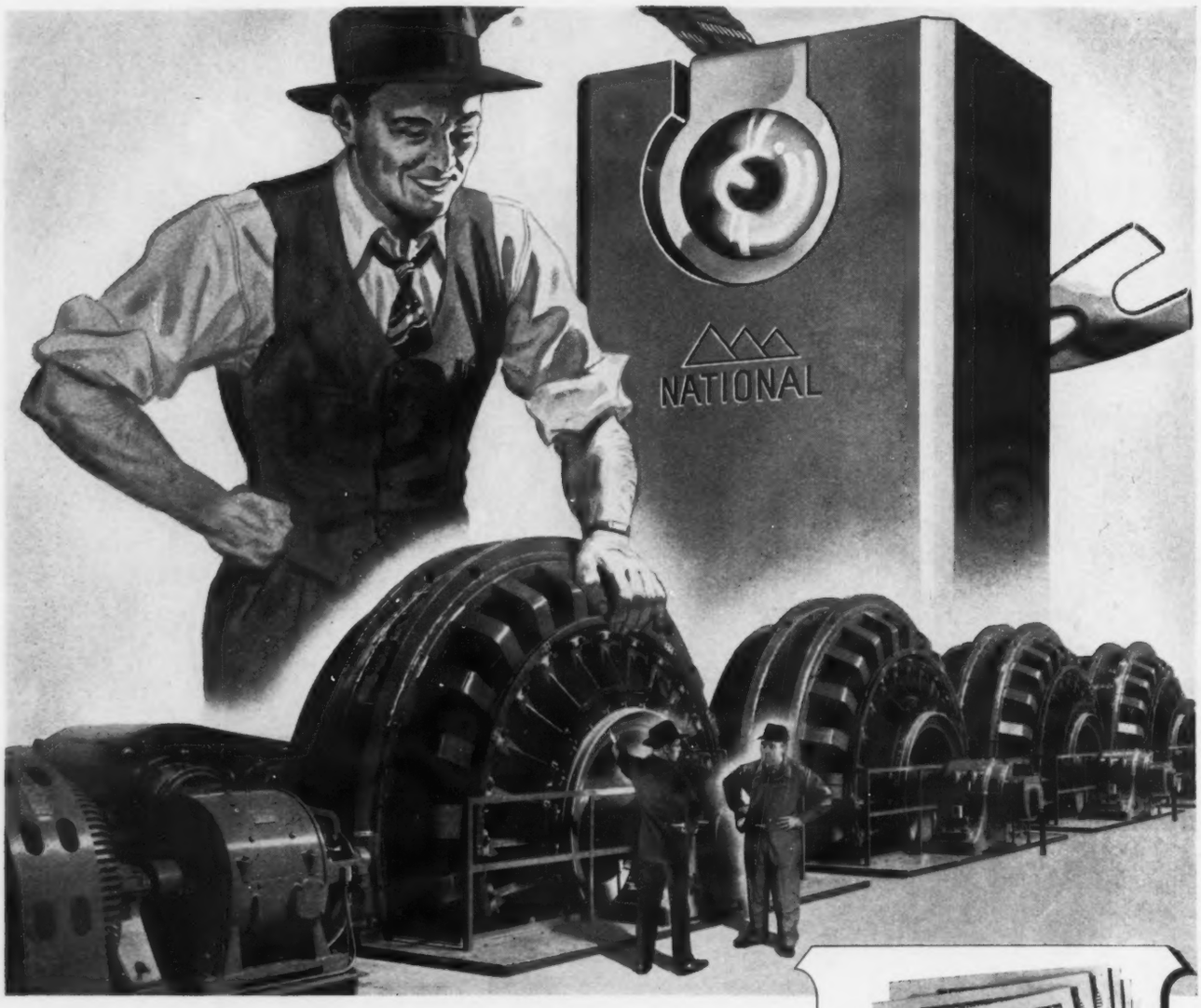
SQUARE D COMPANY

LOS ANGELES - DETROIT - MILWAUKEE

KOLLSMAN INSTRUMENT DIVISION, ELMHURST, NEW YORK

IN CANADA: SQUARE D COMPANY CANADA LIMITED, TORONTO, ONTARIO

SQUARE D MAN



KEEP THEM RUNNING

DEPENDABLE POWER IS ESSENTIAL IN THE PRESENT EMERGENCY

● Assure yourself of dependable brush performance on your electrical equipment by enlisting the aid of your National Carbon sales representative. He is capable of giving you valuable assistance in the selection and application of brushes on your generators and motors.

As further assurance of maximum reliability and economy of operation, the services of our engineering staff, experienced in the solution of difficult operating problems, are yours at no added cost when you specify . . . .

NATIONAL CARBON BRUSHES
TRADE-MARK

MODERN PYRAMIDS
Another NATIONAL Service

These bulletins contain practical information on brushes and commutation of especial value to operating and maintenance men. If you are not receiving them, send us your name and address.

NATIONAL CARBON COMPANY, INC.
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BULLETINS

data books, etc.

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Your being right up-to-the-minute may have an important bearing on your success. New developments are appearing daily in your field—tools to help you do a better job. Are you abreast of them? You fall back a step when the other fellow is well informed about a subject of which you are ignorant. Manufacturers' publications are a quick, efficient way for you to keep posted on current events in your field.

Isn't it a bargain to invest 1c (the cost of a postcard) to help earning power to which you look forward? American industry is offering a remarkable service—free. ELECTRICAL WEST makes it easy for you to enjoy this service for your own. Check and mail the coupon below. That's all you have to do to help yourself toward better performance and greater rewards.

Floodlight Practice (114)

For night production and protection in outdoor areas near manufacturing buildings, and for construction projects, recommended floodlighting practice is described in a new 22-page bulletin announced by Westinghouse Electric & Mfg. Co., which is divided into 6 parts: typical applications of protective floodlighting; application of principles to the points requiring protection; floodlighting for production; typical industrial plant applications and lighting units for protective and productive lighting. Positions of lighting fixtures relative to ground and buildings are shown by drawings for the following aplications: shipways, railway yards, freight terminals, storage and handling of materials and building construction. Aplication data gives floodlight types, locations, spacing, aiming, and mounting type.

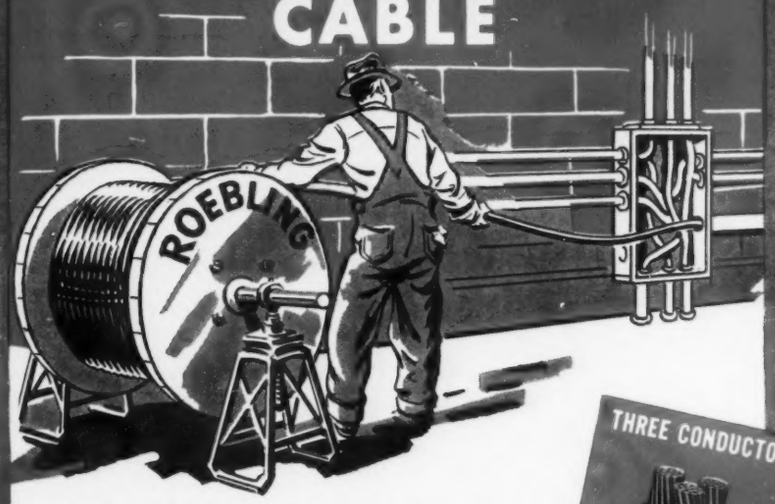
Patents (115)

Designed primarily for engineers and executives dealing with inventions, a 54-page booklet entitled "Patent Background for Engineers" has been issued by the Allis-Chalmers Mfg. Co. Written by patent attorneys, and engineers for the lay mind, the articles deliberately avoid legal technicalities. Articles in the booklet cover such subjects as basic patent considerations, the importance of the drawing, specification and claims in evaluation of patents; patent fallacies, protection of new inventions, safeguarding of inventors' rights, importance of determining the original inventor, joint inventorship, effect on product sales of an invention prior to patenting and the trend and development of patent law.

Gripmasters (116)

Description of the Gripmaster line of strain release, and the adaptability of the line to cord and cable applications, is featured in the bulletin of the George Walker Company. The bulletin is illustrated with application drawings.

TEMPERATURES ARE HIGH...
SO IT'S
ROEBLING
Varnished Cambric
CABLE



Whenever heat is a factor on your power, heating and lighting circuits specify a Roebling Varnished Cambric Insulated Cable.

Operating temperature can safely go as high as 85° C., for example, on lines up to 5000 volts. And because only the finest grade of black asphalt tape is used—higher dielectric strength and low power factor are obtained.

ABOVE GROUND—If excessive moisture is encountered, cable should be lead encased or enclosed in an extra heavy reinforced rubber sheath. For normal installations a braided covering is satisfactory, the type of finish depending upon service conditions.

UNDER GROUND—Must be lead sheathed. If buried directly in the ground or installed in mine shafts, steel tape armor is usually added over the lead sheath. In a bore hole, vertical riser or submarine cable, round wire armor may be necessary.

Single or multiple construction—furnished in all sizes of conductors from 2,000,000 circular mils to 14 AWG in single conductor or 750,000 circular mils to 14 AWG in multiple conductor. Thickness of insulation and test requirements are in accordance with Insulated Power Cable Engineers Association specifications.

OVER 60 OTHER TYPES

of Roebling Electrical Wires and Cables are made in our mills under complete Roebling supervision and inspection—from copper bar to final reeling or spooling. They include: Power Cables, Weatherproof Wire, Bare Wire and Strand, Building Wire, Portable Cords and many others.

JAR ROEBLING

JOHN A. ROEBLING'S SONS COMPANY
OF CALIFORNIA
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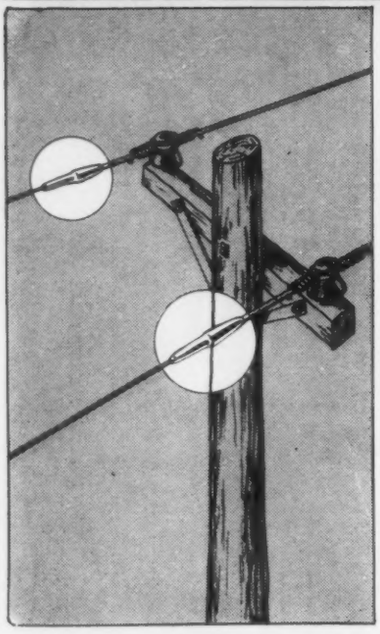
modernize
YOUR
DISTRIBUTION
PRACTICE—



Urban construction where line drops portion of load and smaller wire size will carry current flowing through the rest of circuit.

RELIABLE STRAIGHTLINE REDUCERS . . . .

Save money and clean up appearance while eliminating a double dead-end. Sag of larger wire is only increased two or three inches as spans of city distribution are short.

Reliable
ELECTRIC COMPANY
OVER 30 YEARS SERVICE TO THE UTILITIES
3145 CARROLL AVENUE · CHICAGO ILLINOIS

Disconnecting Switches (117)

Disconnecting switches are the subject of a 12-page bulletin issued by the W. N. Matthews Corp. The Matthews line of porcelain-housed and open type disconnecting switches are shown in photographs and detailed diagrams. Dimensions and ratings are given for each unit, together with general descriptive data.

Door Chime Details (118)

A. E. Rittenhouse Company, Inc., manufacturers of electric door chimes, have a 15-page bulletin illustrating and detailing their new line of electric door chimes, bell transformers, signalling transformers and special transformers. The bulletin pictures the company's various products and the company's illustrations with specifications and installation data.

Distribution Data Book (119)

Of particular interest to distribution engineers working on problems involving distribution circuits and equipment, a distribution data book compiled from various sources by General Electric Co.'s Central Station Engineering Department is available on request. The book is divided into sections on circuit characteristics, short circuit calculations, voltage calculations, volting data and losses and economic data. Also included is a section on lighting-protection data and a bibliography.

Defense Wiring (120)

A bulletin on wiring devices for national defense has been published by Pass & Seymour, Inc., presenting in summary form the P & S wiring line compiled as a reference for the selection of material for construction repair and maintenance under the defense program. According to the manufacturer, only those devices which are used extensively in defense work, with particular reference to their approval under Federal specifications W-R-151, W-S-893 and W-S-896 are included. Units for both flush and surface installations are described and pictured together with descriptions of the item and its ampere rating.

Recording Units (121)

A 27-page catalogue, describing recording instruments for telemetering and totalizing electric-power loads, has been issued by Leeds & Northrup Co. The catalog contains information and pictures, diagrams and text on use of load recorders by isolated utility and industrial power plants and by power consumers, as well as the better known applications in system load-dispatching.

Rectified F Lamps (122)

The subject of rectified fluorescent lamps and luminaires is covered in a 24-page illustrated booklet published by General Electric Lamp Dept. The bulletin shows the vision advantages to workers under fluorescent lighting, how factories may have high light output from a lighting system, high efficiency, cool illumination and elimination of shadows. Supplementary illumination, tables for mounting heights, uniformity of light and essential data as to industrial white and blue-white G-E RF lamps are covered in the publication.

Portable Tools (123)

The 1942 line of Thor portable electric tools is described in a 64-page catalog issued by the Independent Pneumatic Tool Co. In four major sections, the book gives complete descriptions, specifications and prices on the Thor line of universal type electric drills, drill stands, screw drivers, nut setters, tappers, saws, hammers, nibblers, grinders, anders, polishers and electric tool accessories. Featured in the new catalog are the Thor 1/4-in. and 1/2-in. capacity drills, the original small and light tools for fast drilling.

EASY WAY TO GET INFORMATION

To keep posted, simply circle the items in which you are interested, cut out the coupon (it can be pasted on the back of a postcard) and mail to:

ELECTRICAL WEST, 68 Post St., San Francisco, California
Please send me the following CIRCLED items:

100 101 102 103 104 105 106 107 108 109 110
111 112 113 114 115 116 117 118 119 120 121
122 123

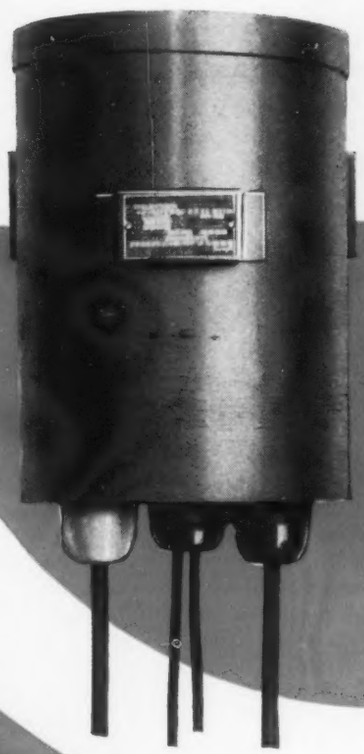
Name ..... Company*..... Title*.....

Address

* Please include your company's name and your position, as we cannot ask manufacturers to furnish literature unless you do.

ANNOUNCING A NEW OUTDOOR POTENTIAL TRANSFORMER.

The JE-3



TYPE JE-3

For outdoor metering applications
2300 volts and below

INSULATION

230, 460, and 575 volts—full-wave, 50 kv;
2300 volts—full-wave, 60 kv

ACCURACY

¼W, ¼X, ½Y

NOW, G. E. OFFERS... A complete line of outdoor current and potential transformers, 15 kv and below, which conform to ASA insulation standards

These new standards, which are met by this now complete line of transformers, provide a means whereby all apparatus on a line can be co-ordinated to have the same insulation strength. This facilitates the selection of adequate protective equipment.

All these transformers meet or exceed the highest accuracy standards and can be obtained in a wide variety of mechanical constructions to meet every installation need.

Ask your G-E office for a copy of our new bulletin, GEA-3650, which covers both outdoor current and potential transformers, 15 kv and below. Or write General Electric, Schenectady, N. Y.

GENERAL ELECTRIC

601-6-6400

ELECTRA'S HUSBAND

Blackout—But Not In

"NO AIR RAID warden will criticize that job the next time the siren blows," I said to Electra as I dragged the step ladder out of the bathroom. "That's one more blackout for the Japs. Bedroom, kitchen, hall and bathroom—you can read in bed, we can eat without interruption, we can move around without breaking a leg, and we can keep clean irrespective of what happens."

"It had better be good," Electra broke in, "because if it isn't I'm going to buy black paint for the windows. And you can paint them. You won't be able to hem yourself into a corner like you did when you varnished the kitchen linoleum."

And so we, like millions in England, get a taste of blackouts—a little hysterically to be sure. But realistically. Homes, buildings and factories from the Mexican border, along up the Coast through British Columbia to Alaska are draped, painted or boarded up to keep light from revealing topographical secrets.

It was inevitable that along with the grimness and realities of the blackout processes in scores of cities and towns, there were humorous experiences. If there hadn't been some such stories to tell Electra, I think she too might have had a touch of hysteria.

There was the case of the apprehensive but zealous Home Guardsman who got the vice-president and general manager of one of the largest power utilities on the Coast out of bed at two in the morning during the initial blackouts.

"I've called and called your company's phone and I get nothing but a busy signal," his obviously anxious voice said over the telephone. "The street lights out here are still burning. If you, personally, don't get them turned off right away, I'm going to start shooting them out with my gun."

"If you start shooting, sonny." the g.m. replied, "you'll be in for a lot of target practice because I can't turn them off from home."

Something like that actually happened on a construction job for the Army at one of the Coast seaports. As an anti-subversive measure, the project had been floodlighted. When the troops guarding the job couldn't find the control switches, they shot the lights out. The electrical contractor on the project has one of them on his desk as a souvenir. An encouraging note is that it has only one hole in it.

UNFORTUNATELY there were some other experiences of another kind. They were due to over-zealousness in some instances and to lack of definitely assigned responsibility. In Los Angeles, there are more than 800 separate street lighting circuits scattered over the 450 square miles of that community with upwards of 60,000 separate lights installed. Each is individually controlled by an astronomical clock. Each must be turned off manually in case of an emergency.

During the first blackout most of the employees assigned to that task were stopped and forcibly detained despite the credentials they carried. Then the next day all kinds of unjustified criticism was leveled at the utility by people who did not understand why the lights burned during the blackout. That was typical of some of the physical problems that confronted the utilities.

ELECTRA couldn't see the engineering significance of the request of the local defense council in one good-sized Western community that the power company dim the lights twice in succession as an air raid warning. This resolution (the council wanted to make it formal and legal) was offered in lieu of the purchase of sirens or other equipment. And unfortunately there were no engineers on the council to explain what such a procedure would entail.

Almost 50,000 kw. of load was involved, served from high lines into three different distribution substations. The only way of accomplishing the light dimming was by opening the oil switches on the high side of each of these substations and hoping they could be closed again without unstabilizing an entire sytem and knocking it high, wide and handsome. No warning would be needed then. The lights would be out—maybe for half an hour. So would everything else that depended on electricity for its operation.

A SOCIAL ITEM that caused Electra to chuckle deals with the wedding of the son of the vice-president of one of the biggest power companies in the West. It was a formal wedding set for eight o'clock. Only trouble was that at 7:15 an air raid alarm started that lasted almost three hours. Everything was dark and it would have taken more authority than a v-p. carries to have lit even a candle The wedding finally took place at 11 o'clock, with several of the guests missing.

THE INADEQUACY of the initial blackouts, particularly as regards electric signs, led to some peculiar rulings. One local defense council noting how promptly the utility turned out the street lights, ruled that the power company should handle all neon signs in the same manner, not knowing that these advertising lights were virtually all time-clock controlled. Misunderstandings of this kind brought forth some succinct statements as to what a blackout involves and who must share the responsibilities. Here is one by Hance Cleland, president of the San Diego company, that people in the industry can remember and quote:

"A considerable misunderstanding exists with respect to the nature of a blackout, and the way it is effected by the organization furnishing the supply of electricity to the community. *Blackouts do not entail turning off the electricity supply in a community.*

"Such a procedure would seriously interfere with our own military and naval activities, and would be very detrimental to civilian morale. It would cause a serious hazard in hospitals and in many other public services. In European countries long subject to blackouts, every effort is made to maintain continuous electric service for the reasons above given.

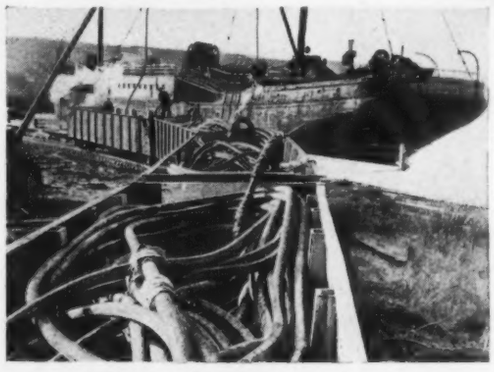
"The company supplying electricity will, upon receipt of orders from the properly constituted authorities, shut off the street lights, thus serving the dual purpose of cutting off the most conspicuous illumination, and at the same time informing the populace that a blackout is under way. It remains the duty of every householder, store owner or building operator to black out his own premises either by turning out his lights entirely or by so screening them that they will not be visible from outside the building."

Electra says the sirens have started again. So blackout.

Most of the Cables for High Voltage Jobs Like These ARE MADE BY OKONITE

Applying the galvanized steel armor wire and saturated jute to a 5½" diameter Okonite submarine power cable.

Diver checks trench-laying of high voltage submarine cable on ocean floor. Cable section (⅓ actual size) shows construction of 22,000 volt, 500,000 CM non-leaded Okolite-insulated submarine cable.



22,000 feet of Okonite submarine power cable in one continuous length. This cable is the third in the submarine series ordered by the same customer within the past 15 years.

Special reels equipped with lifting beams simplify transport of huge cable reels from factory to site of installation.

Okonite has earned the privilege of manufacturing the majority of the high voltage rubber-insulated submarine cables laid in the rivers and territorial waters of the United States during the past 5 years.

The following records have been established:

VOLTAGE: *up to 35,000 volts non-leaded*
DIAMETER: *up to 5.6 inches*
LENGTH: *up to 22,000 feet without a joint*

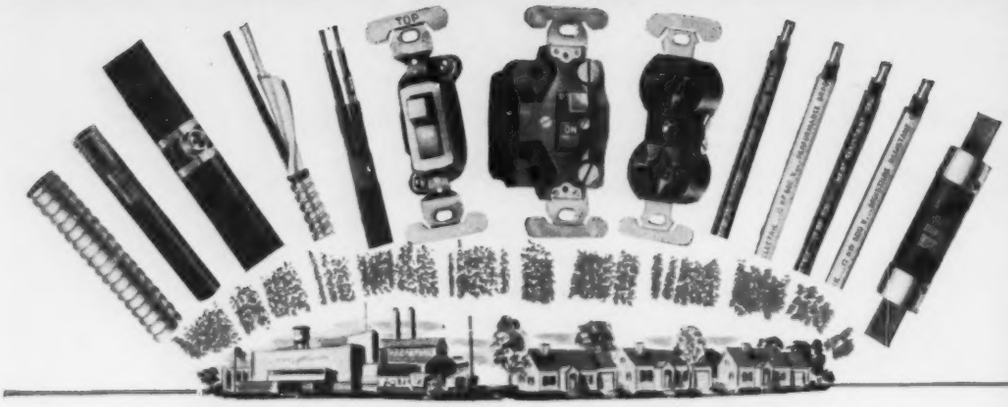
A partial list of Okonite rubber-insulated submarine cables operating at 13,000 volts and over, includes installations in every major area of the country: California, Pennsylvania, Washington, Rhode Island, Texas, New York, Illinois, Louisiana and Virginia.

When you are figuring on a submarine cable installation, ask Okonite engineers to make recommendations. These will include proper cable design and test procedure, preferred methods for shipping the cable and suggestions as to installation practise.

THE OKONITE COMPANY
Passaic, New Jersey
Offices in principal cities

OKONITE OKONITE **SUBMARINE CABLES**

G-E MATERIALS
FOR EVERY WIRING JOB



IN FACTORIES, HOMES, ETC.

Distributors in All Parts of the Country

Wiring materials in the G-E line are suitable for wiring factories, homes, stores, apartment houses, etc. The line is complete. It contains the materials you need whatever sort of job you are about to handle.

G-E distributors are located at key points all over the country.

The quality of G-E Wiring Materials is uniformly high. They are easy to use and will give dependable service. Your customers are sure to be pleased.

Two manuals have been prepared which will be helpful in planning industrial wiring and residential wiring. Further information about G-E Wiring Materials is also given in the manuals. For copies of them, see the nearest G-E Merchandise Distributor or mail the coupon.

THE G-E LINE INCLUDES

- G-E White Conduit
- G-E Black Conduit
- Flexible Conduit
- EMT
- Fiberduct
- BraidX
- BX
- Boxes
- Fittings
- Wire Types:
  - R
  - RP
  - RH
  - RW
  - SN (Flamenol)
- All-rubber Cords
- Braided Cords
- Switches
- Sockets
- Convenience Outlets
- Plates
- Combination Devices
- Fuses
- Small Circuit Breakers
- Twist-Lock Devices
- Plugs, Caps, Bodies

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General Electric Company
Section CDW-2181
Appliance and Merchandise Department
Bridgeport, Conn.

Sirs: Please send me ☐ the G-E Home Wiring Handbook ☐ Adequate Wiring for Industry

Name .....

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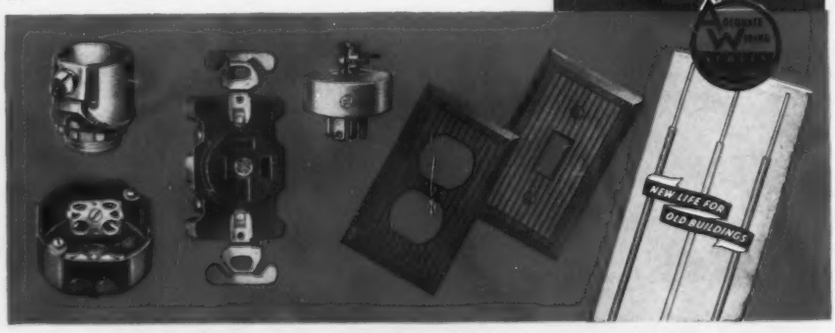
City ..... State .....



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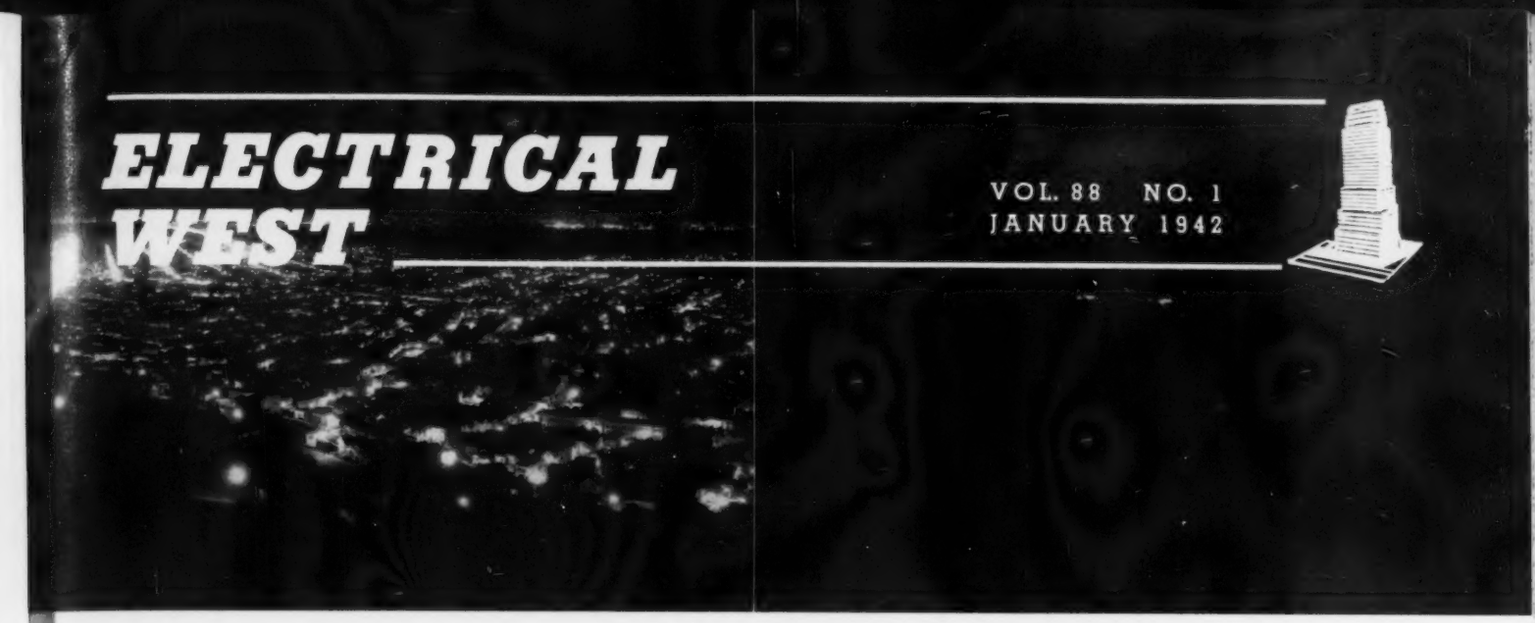
GENERAL ELECTRIC

ELECTRICAL WEST

VOL. 88 NO. 1
JANUARY 1942



BLACKOUT

Life must go on; light too, if obscured from view. A concise summary of what to do and to advise the industry's customers to do

BLACKOUT came to the Pacific Coast Dec. 8, 1941. Something that few people would bring themselves to believe would ever happen in America did come. Few people could imagine a below-the-belt attack on Hawaii, either, but it too had happened the morning previous.

First and most vital necessity in making the blackout really black was to cut out *all* light. In itself that was a far more complicated task than the laymen police and even army officers conceived.

Something *can* be done to carry on such activities of life even in the blackout. It is highly desirable that it be done. In industry it is desirable so that war and defense production will be increased rather than decreased. Commercially it is desirable for the vital exchange of goods and services necessary to a supreme war effort.

Domestically it is desirable for civilian morale—to counteract the primitive instinct of fear in the dark, to discourage panic, to prevent needless accidents, to protect women and children left alone. Keeping busy is the best antidote to fear and yet keeping busy in the dark is difficult, if not impossible.

It will be the purpose of this article to give fundamental instructions for obscuring factories and commercial occupancies such as restaurants, stores, garages and similar essential service shops so that light may be used freely within them without endangering the surroundings by escaping light. Domestic obscuration methods will be treated in the Dealers' Business Guide, page 46, in this issue.

Blackouts should be accepted as a military necessity. For the time being all question as to their relative effectiveness and the weight of their value against their cost and hazards must be deferred in the paramount interest of winning the war. Questions as to the probable frequency of bombings, if at all, of their severity or extent can be argued later and elsewhere. With a treacherous enemy, obsessed by a suicidal fanaticism, the Hawaiian attack shows that it does not do to relax alertness.

Without questioning the need for blackout it is prudent to understand its purpose, its effectiveness, its limitations and its dangers or hazards. In a few words here they are:

Purpose of a blackout is not so much to hide cities in the dark as to make it difficult to find reference points. Cities cannot be completely concealed, especially if near rivers, harbors, lakes or natural landmarks. But the pattern of a city's streets and certain buildings, parks, other details are known to the enemy. Their relation in distance and location to important military objectives is also known. The blackout makes it more difficult to find these reference points. Even a few lights may betray their presence.

Effectiveness of the blackout is relative. Moonlight defeats it. Flares can kill its effectiveness. Distinctive harbors or coastlines sometimes tell too much even in the dark. Fires started by incendiary bombs can light up landmarks.

The *Limitations* it imposes are those of movement—to transport supplies, seek shelter, fight fires, give aid to the injured, guard property. The blackout immobilizes virtually all outdoor activity and restricts indoor activity to well obscured buildings.

Its *Dangers* are those of accidents—to vehicles, to pedestrians, in the darkened home or building, in the performance of warden or other defense duties. Early tendencies to confusion and panic give way to more orderliness as experience is gained.

Scope

If the purposes of a blackout can be served, and it is desirable to have light to carry on production and normal living activity as much as possible even during a blackout, how can these opposites be attained at the same time?

The problem is largely mechanical—structural—that of preventing the leakage of light from interiors in which life and its activities may go on. It is by no means always easy. Light can squeeze through the minutest of pinholes or cracks, can bounce around from one surface to another and show outside when everything else is pitch black.

Outside lighting, such as street lighting, vehicle lighting, directional signs and traffic signals will not be treated of here. Methods for handling these problems will be issued as *regulations*,

with very low brightnesses specified, specific equipment required and their use police enforced. Data on such equipment will be available later.

It is important right now to treat factories, small shops, garages, offices, restaurants and stores first. (Homes too, as discussed on page 46). For such methods the recommendations in the Civilian Defense manual, *"Blackout"*, and the experience in England, gleaned from articles and drawings in *Electrical Review*, the IES magazine *Light and Lighting* from England, and *IES Lighting Review* of Australia, will be drawn upon freely in the spirit of one ally with another, yet in grateful acknowledgement. Use will be made also of digests of *Blackout* and of its drawings through courtesy of the Blackout Precautions Advisory Committee, San Francisco Civilian Defense Council.

Factory Management Considerations

Electrically, the blackout of an industrial plant of any size involves its lighting, power supply, and communications.

Mechanically, it involves physical means of obscuring windows, doorways, ventilating ducts, skylights and any other openings from which light might leak. It also involves protection against damage from shattered glass. It requires increased ventilation to compensate for closed windows. It calls for guiding white lines on walks, steps, exit markings. It also involves camouflaging of distinctive objects such as water towers, stacks.

Economically, preparation for blackout should be considered from these aspects: Relative cost of permanent total obscuration and reliance entirely on artificial lighting as against cost of making up, storing, maintaining, and quick installation and operation of temporary devices in order to use daylight during the day. In any case extra artificial light will be needed to balance against certain obscuration measures that will be permanent.

In surveying an industrial plant for the establishment of blackout precautions the following factors among others should be taken into consideration:

1. Emission of direct or reflected light from factory buildings must be prevented normally by screening all windows and skylights with dark blinds or paints. Outside lighting in general is prohibited.

2. In what portions of the plant is it necessary that there be light? Offices, manufacturing areas, toilet facilities, areaways, truck and railroad loading platforms, communication areas.

3. In what portions of the plant would it be possible to extinguish lights without impairing production or creating an accident hazard?

4. What entrances or exits directly to the outside must be rendered capable of use during blackout conditions?

5. What processes are there which develop glow or otherwise spill light outside the plant? Are these continuous or intermittent? Can work be planned so that such intermittent processes might be undertaken during daylight hours or suspended during blackout without great loss?

6. What system of ventilation is used and would obscuration of windows or blacking out of openings impair the ventilating system?

7. Specific questions regarding obscuration of windows: How many different types of windows or other openings are there? (Double hung windows—casements—flat skylights—skylights on an angle—sawtooth roof formations—monitor roof formations, etc.)

8. With respect to each of the above, special problems involved (area, accessibility, ventilation, and whether light may or may not be permanently obscured or whether drapes or easily removable frames may be used to permit daylight.)

9. What is the relation between the probable cost of complete, effective obscuration and the probable loss from shutdowns if obscuration methods are not installed?

10. Is there a need for immediate use of emergency methods of obscuration to be replaced later by more permanent methods?

11. What consideration should be given to splinter protection?

12. What other special problems such as light wells, elevator shafts, ventilators, outside lights?

13. Are there any bright reflective surfaces which should be painted? (Buildings, tanks, signs, etc.)

14. Are there outside areas now being used for productive or other essential purposes which, if totally blacked out, would cripple production?

Hazards

To be guarded against are these hazards:

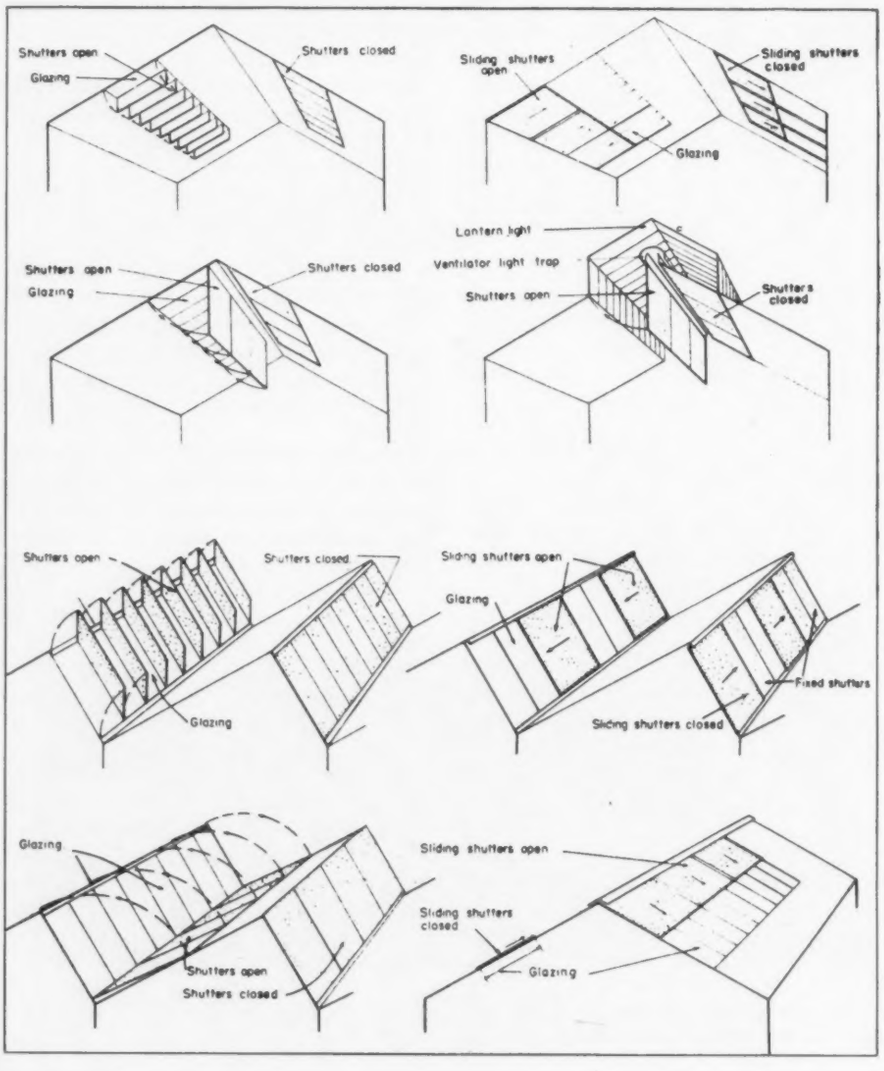
Glass breakage, which would render the blackout void by allowing light to leak out. Shattering glass would also be dangerous to persons. Glass can be shattered from as far as 200 to 500 yards from the explosion of a high explosive bomb. Glass will also suffer from falling anti-aircraft shell fragments. Blackout methods should be designed with this glass hazard in mind.

Fire, caused by incendiary bombs. Methods for handling have been widely publicized. Light by which to get equipment for fire fighting should be considered by a factory, however.

Gas may be used to render a vital area or industry uninhabitable. Techniques for decontaminating are a separate problem.

Sabotage may become more of a hazard during blackout. This may call for automatic alarm and other electrical protective

Schematic sketches illustrating means for obscuring various types of skylight



systems in addition to blackout provision. Invisible infra-red or ultraviolet systems of photoelectric cell protection should be considered.

Electrical Preparation

Lighting circuit control should be so arranged to enable instantaneous dousing of lights in case of actual bombing, even in industries which decide to keep operating under blackout. This obviously is to protect employees and to prevent light escape in case a direct hit or shattered glass or screens would expose still burning lights.

Workmen must have a high standard of illumination, especially if the daylight is completely shut out, but should have the assurance that if an actual attack comes, they will be protected. To plunge them into darkness suddenly after working under high intensities leaves them temporarily blinded.

To find their way to exits or shelters an auxiliary or pilot lighting system of exceedingly low intensity, well shielded to conceal light sources, should be provided. Preferably this should be put on separate circuiting to go on as the main lighting is cut off, go off again when the alarm is over or when the plant is closed. Still better is to have such lighting on an emergency battery independent of main power supply.

Study of the lighting distribution system will be necessary to determine the best way to cut off all lights quickly. Monitors or employees assigned to certain stations are not so reliable as a system of contactors to cut off selected and centralized lighting circuits. Sometimes this can be done by a circuit to energize the overload trip coils on the lighting main circuit breakers. Lighting on power banks should be changed over to lighting banks if shutting off of power is undesirable.

Power supply should be studied in relation to the needs of various departments and processes. Machine tools, air compressors, similar intermittent duty equipment can be shut down without loss, but furnaces, plating tanks, electrolytic processes, brooders and incubators, elevators, and certainly fire and water supply and sump pumps must be kept going. Each plant's own peculiar processes and necessities will require study.

Communication is a necessity. A simple sound system, or a simple telephone system, not necessarily point to point, to a central board, will afford means to warn the plant, to give instructions, to communicate with shelters. An alarm bell or horn with a definite, simple system of signals for "alert", "go to shelters", "all clear" is necessary.

Mechanical—Obscuration

Obscuring a building calls for methods to black out windows, placing light locks at entrances, exits, and loading platforms; and the shielding of ventilating openings. Permanent methods are simplest, but they require working under artificial lighting entirely.

Structural conditions vary so much that the *principles* involved will be treated here, rather than a comprehensive attempt to cover all conditions. Ingenuity will adapt these principles to the particular problems appearing.

Materials

Materials used in obscuration include paint, heavy opaque papers, closely woven dark fabrics, wallboard, plywood, sheet metal, roofing paper, wooden sheeting, screen frames over which some of these other materials are placed.

In the selection of material consideration must be given to (1) whether it is to remain in place for the duration or be removed to admit daylight, (2) what protection it gives in case the glass is shattered by bomb explosion concussion or anti-aircraft fragments, (3) what protection against weather in case of glass fracture.

Paint is the quickest and easiest material to apply, but it gives no protection against fracture of glass or against weather in case the glass breaks. It may do to black out temporarily and much of it is being applied, but should bombing actually occur, it will have to be supplemented by inside screening as well.

Much paint is being applied on the inside of windows. This is not the recommended method. An asphaltum waterproof paint of dull finish is recommended painted on the outside of windows to reduce the reflection of the glass itself, which can be seen by moonlight. Such paint has the additional advantage of being removable after the war is over.

When black or dark paint is applied to a window, inside or out, an inside coat of white should be applied too. With black paint, the interior illumination will be soaked up. With white it will be returned to the room to make it more cheerful, to increase seeing ability, to decreased the walled-in effect.

Paper applied to glass is likewise a permanent method. It has the added value of reducing fracture hazard. Unless it is waterproofed or painted over, it has to be put on inside, with a generous overlap to the frame to prevent light leakage at the edges. Again a white paper should also be pasted over the black paper to increase reflection of inside lighting. Tough, strong fibered papers are best.

In those cases where a permanent or semipermanent obscuration is desired, the following types of paper may be used:

Reinforced building papers
Unglazed laminated building papers
Black Kraft building papers
Black corrugated papers
Heavy weight or double thick cardboard or cover paper, in dark shades
Showcard board, in dark shades
Wallboard
Opaque shade cloth

When using paper, extreme care should be used in sealing the edges in order to avoid any light leakage. Experience has indicated that tacking or nailing directly on the paper around the edges will not suffice inasmuch as atmospheric moisture and changing weather conditions have a tendency to make the paper draw. For this reason it is essential that edges be sealed with tape, or that a wooden strip (such as a batten or lath) be placed over the edges before nailing. It should be noted that an effective obscuration is difficult with paper or paper products and that frequent inspections should be made of all paper applications.

Glues or adhesives used should remain tacky or adhesive even after exposure to the sun. This quality also reduces the likelihood of scattering glass splinters in case of breakage. Cooked flour paste to which 5% glycerin or molasses or gum arabic has been added is recommended.

Cardboards will require stronger glues. The cardboard should be wet when applied.

Heavy Chip Board, cut accurately to the size of the window frame and edged with felt to make a tight fit can be used for standard office windows. They can be taken out after the alarms are over. Frequent inspection to see that these boards are undamaged will be necessary.

Textile Materials: All types. (1) Those which give permanent obscuration and (2) those which admit a certain amount of light. Of the former, sacking pressed into a bituminous emulsion painted all over the glass is opaque and gives good resistance to splintering. This is a suitable method for use on factory sky lights where obscuration is required. Of the latter, cotton, linen, sisal or other light colored fabrics pressed into an adhesive, is reasonably translucent and gives good resistance to splinters.

Strips: Textile materials may be used in strips in a pattern leaving open rectangular spaces not greater than 6 in., each way. Surgical adhesive tape and insulation or tire tape are typical materials. Adhesion is improved if pressed on with a warm iron.

Adhesives in General: Important requirement is that they should not dry out and become brittle. Hence the need for adding glycerine or molasses. "Bookbinders' glue" is suitable for hot application for cardboard. Paper hanging pastes are suitable.

Splinter Protection

Materials suggested: (1) Wire netting, ½ in. mesh or less, as close to glass as possible. (2) Curtains or blinds—burlap or sacking weighted at bottom with wooden battens or metal rods or pipes.

Light Weight Screens

In areas where more than one raid may take place, it is hardly worth while to replace broken glass with new. If glass is broken, window openings are closed with some form of screen that will continue in use under more than one blast effect. Weather resisting screens easily made and put into place, completely filling window openings should yield to blast and fall out harmlessly so that they can easily be put back again. Such a screen serves to arrest flying glass; and serves as obscuration. Screens are placed on the room side of windows and are covered with any inexpensive, flexible, light weight sheet material that is not likely to warp and can be made to resist rain. The sheet material should be mounted on a light wooden frame unless rigid and strong enough to stand by itself.

Sheet Materials: (1) Strong liner paper, minimum thickness .016 in. Suitable for windows well protected against blast and driving rain. (2) Corrugated fiberboard (or double faced corrugated board) can be used without a frame on small windows, say 4 ft. x 2 ft., or less. Edges should be protected with paper

stuck on before painting. (3) Thick, solid cardboards—strong container board or chipboard. (4) Wall board or building board. Insulating board about ½ in. thick or dense pressboard about ⅛ in. thick; the latter is preferable. Can be used without frames on small windows. (5) Plywood. Any grade suitable. 3 ply adequate but liable to warp. (6) Wire netting and fabric. (7) Very thin box cardboards—cross battens or frames with cross members necessary. (8) Thin metal sheets suitable where weight not excessive. (9) Bituminous sheeting. Any good roofing felt should be well supported in frames by cross members. Linoleum may be used. (10) Plaster board. Liable to fracture and should be well supported in frames by cross members. Especially suitable where non-inflammability is important. Wooden frames should be coated with fire-retarding paint. (11) Asbestos—cement panels are strong and fire-proof but shatter when hit and thus have a fragmentation hazard.

Suspension of Screens: All but the lightest unframed screens should be suspended so they do not fall to the floor when thrown out by blasts. Best done by fastening screen frame to window head or lintel, with lengths of rubber shock absorber, wide elastic, or rings cut from old automobile inner tubes.

Sky Lights

Present more serious problems than regular windows. Obscuration more difficult, particularly when it is desired to admit light during daytime. Best treatment is to remove glass altogether and cover openings with galvanized, corrugated sheet steel, protected metal sheeting or bituminous sheeting on boardings. (Removal of large areas of glass and substitution of weather-tight alternative construction, often too costly or difficult or wholly impractical.) Alternatives: wire netting which may be covered with fabric firmly fixed below the glass; adhesive coating on the glass.

For suggested methods of handling monitor roof and sawtooth roof types of skylights in factory buildings, see the diagrams.

Light Locks

Entrances and exits should be provided with light locks to permit entry or leaving without leakage of light from opened doors. The principle of the light lock is familiar to the photographic fan. Some of the diagrams on these pages illustrate this principle. Note the relation of wall spaces to the entrances.

Light locks should be painted their complete length in a dull black, non-reflecting paint, including floor and ceiling. A white strip about 3½ ft. from the floor along one wall may be used to guide persons going through them in the dark. Steps should have a white strip painted at their edges and the number of steps painted as a large number at the entrance to the light lock.

To minimize possible light leakage the interior lighting near the light lock should be screened to stop as much direct light as possible from entering the lock. This also helps to accustom the eyes to the radical difference in light intensity between a black outdoors and the well lighted interior. Persons should be cautioned to accommodate their eyes to this change slowly to prevent accidents when going from one to the other extreme.

Methods of Preventing Glow

There is no general method of glow or glare prevention suitable for universal application and each plant must be examined and dealt with on its own merits. In any plant where glow occurs in the process used, considerable thought should be given to planning the sequence of operations so that the phase or phases during which glow does occur take place during the daylight hours. The following are suggested methods which have been successfully employed in Europe:

Glare from the top of active blast furnaces can be screened by the use of large, fireproof louvered hoods carried over the charging platform of furnaces.

Top flames from cupolas can be dealt with in a similar manner.

Glow from inspection holds, slag pipes and other external apertures in cupolas can be screened with large sheds over charging platforms and at ground level.

Reflection of light from kiln chimneys can be dealt with by use of asbestos sheet baffles.

Glow from open hearth furnaces, soaking pits, or foundries installed in open-sided buildings can be minimized by the construction of louvered sides having a large overhang.

Ventilating gaps and louvers in lighted workshops can be screened by external hanging shutters arranged to pass ventilation through a form of light-lock.

Light locks must be placed on all doorways used after dark when the interior is brightly lighted.

Wall fans can be screened permanently by use of large external louvers in reinforced concrete or similar material.

At sugar refineries, illumination and fires in boilers can be quickly extinguished. However, sugar under process (three hours, usually) will cake during any extended shut-down and can be removed only with difficulty; also, after-glow will be visible above the smoke stacks for some time after the boilers are shut down. It would appear that special methods of drawing off sugar being processed and of hiding or quenching the glow should be developed by the refinery concerned.

In oil fields, lights and gas flares can be quickly eliminated, except that heavy gases released without flaring in still, damp weather do not rise rapidly and constitute a definite fire hazard. In this event, the operators should close in the wells or extend the flare line by a riser. For large gas volume disposed of through a single line, such risers might have to be 40-50 ft. in height. The solution used in each case should be adapted to the needs and conditions of that particular field and not applied without prior investigation and tests.

Stores, Restaurants

Certain types of business may be desired kept open in the evening although nearly all businesses have been closing early and turning off all lights just at dusk since blackouts began. Drug stores and restaurants are types of commercial establishments to which this applies. Theaters and night clubs are darkened with little difficulty, as a rule, the only precaution necessary during blackout being the extinguishing of signs, markee and entrance lights.

But restaurants and drug stores present a complicated problem. Large glass

Upper left, recommended new type of saw-tooth roof which would offer better glass protection, less reflection. Other drawings illustrate means of providing ventilation from obscured home, office or factory double hung or casement types of windows

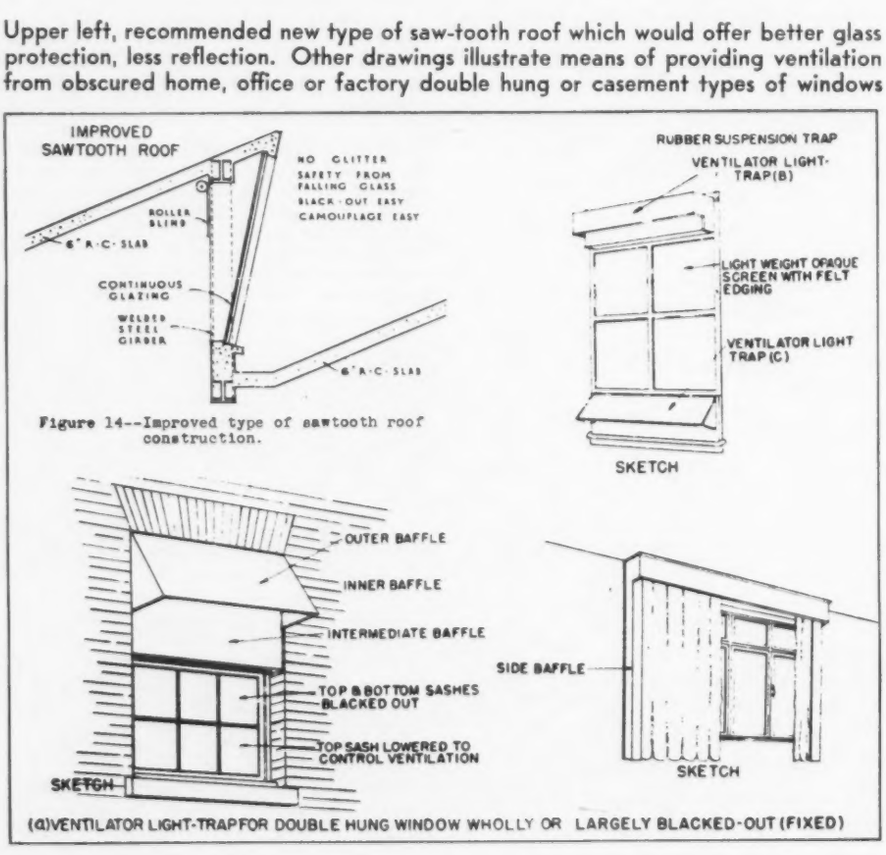
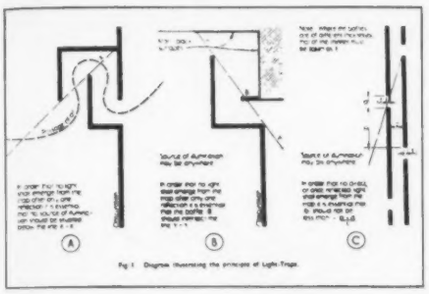


Figure 14--Improved type of sawtooth roof construction.



The principle of the light trap, whether for shielding ventilation openings, doorways or any other types of apertures

areas and open entrances, closely crowded counters or tables, give little space for entrance light locks and make total obscuration difficult. The long narrow store is not so much of a problem. Heavy drapes back of the front windows and similar drapes to form a light trap at the doorway can be arranged. With ingenuity such drapes can be hung from framework that can be hinged to fold out of the way during the daytime.

One of the diagrams shows a form of light trap suitable for a corner store entrance. Where windows have a back wall the problem is simplified. Permanent screens or paint can be used to black out any remaining window space leaking light. Large open backed windows can either be fitted with large plywood or wallboard screens that can be removed for daylight, or provided with heavy double lined drapes that can be drawn aside.

Restaurants with wide expanse of glass should consider the possibility of restricting night service to a limited area at the rear which can be screened by drapes or folding partitions.

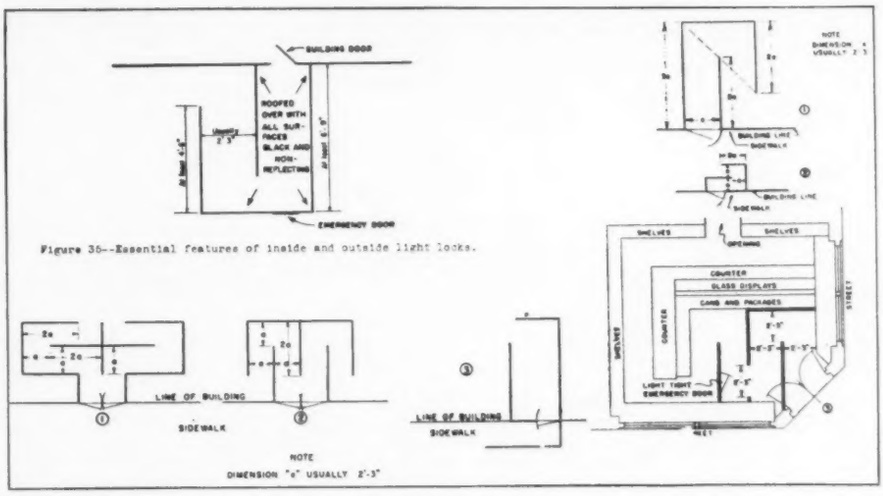
No Blue Light

To reduce the possibility of light leakage, lighting units near *any* window or opening screened for obscuration should be hooded or shielded to direct the light *away* from the drape, screen or paint. The less light falls on such materials the less chance for leakage.

Blue lamps *definitely do not* provide protection. At low levels of illumination the dark adapted eye can see blue better than other colors. Authorities already are outlawing blue lamps and recommending *against* their use.

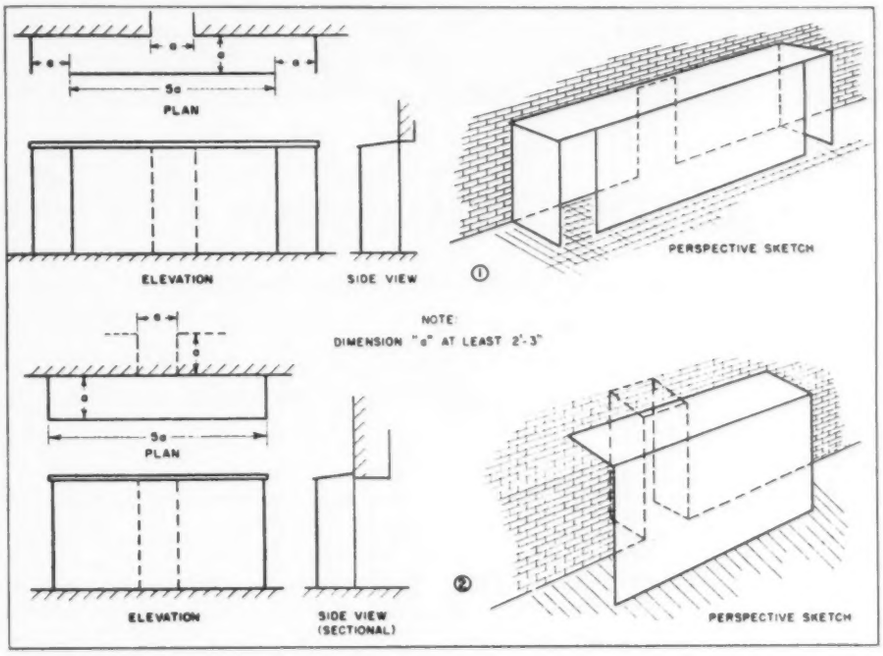
All obscuration materials and methods should be checked for their effectiveness at night and any leakage corrected. A long quiet period may result in laxness and deterioration of blackout means. Periodic check should be made against the surprise alarm.

"Remember Pearl Harbor!"

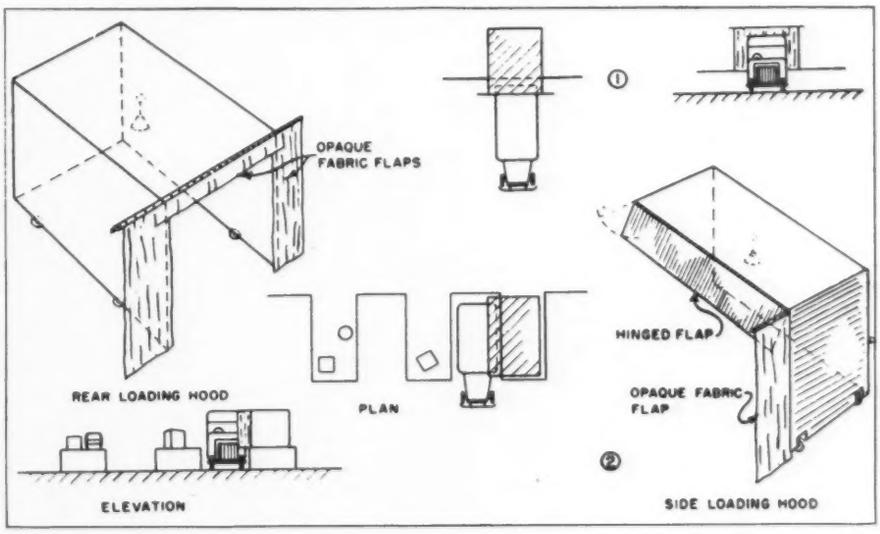


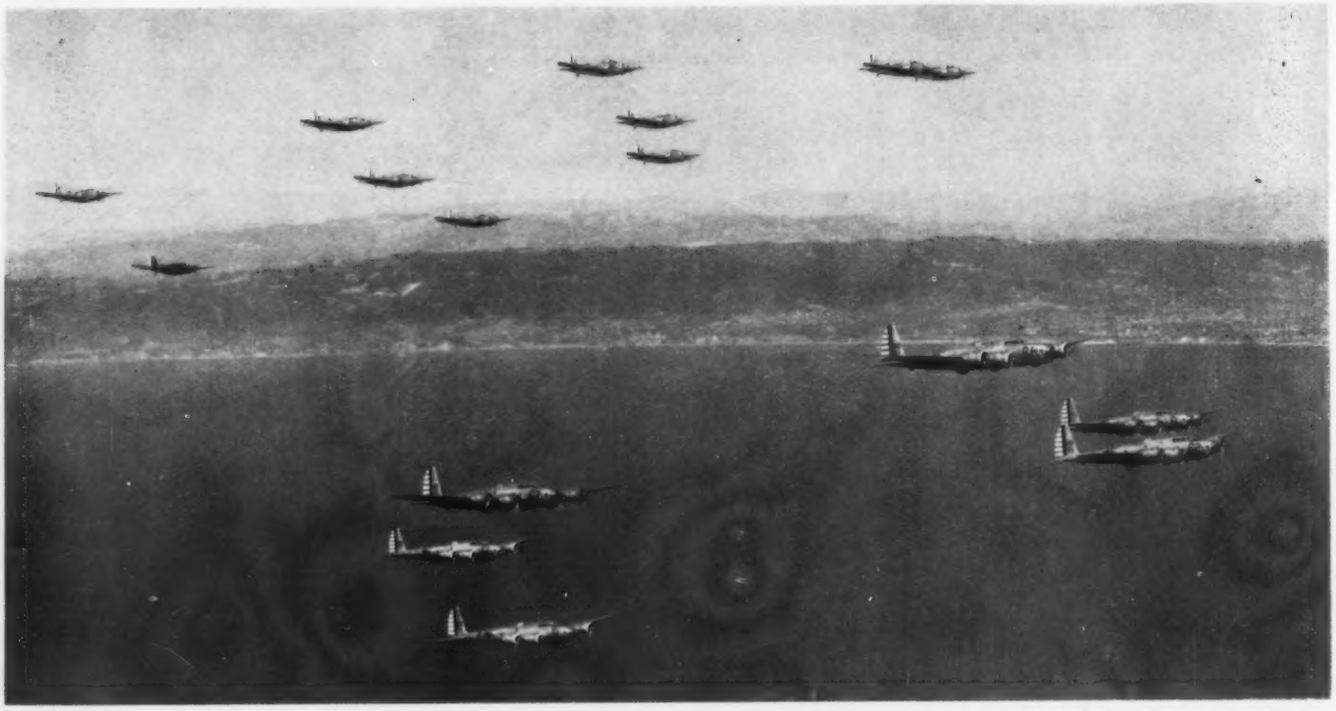
Principles of the light lock worked out in various forms. Proportions are important

Either removable in daytime or set up permanently—two forms of outside light lock



Screening methods for loading trucks or making garage repairs inside of hoods





Official Photograph, U.S. Army Air Corps

Defense Measures For Plant Security

Prepare for any eventuality is warning to power utilities within 300 miles of coast line and in industrial areas. Hence this resume of anti-subversive measures and passive defense activities based upon British experience in protecting power plants, substations and system facilities

WAR'S OUTBREAK caught America napping once. Hence there is need for utilities to heed the warning of Rear Admiral C. H. Woodward of the plant protection section of the Office of Civilian Defense, that utilities within 300 miles of the coast line and in heavy industrial areas be prepared for any eventuality. By any eventuality he means security measures directed against subversive activities and direct sabotage, and passive defense measures necessary to minimize the effect of damage resulting from enemy action.

Plant security by now should be an accomplished fact if recommendations of the FPC, FBI, the Army and the Navy have been carried out. These recommendations involve personnel training and physical protection of plants and facilities by means of fences, signs, floodlights, guards etc.

Security Measures

In case some utilities have not thoroughly organized against possible sabotage, a review of some of the programs now in effect on various Western systems will be helpful. Initial step is the establishment of an anti-subversive committee consisting of key personnel, which will have complete responsibility for the drawing up of a program and its effective application. Where possible this committee should be headed by an individual with military experience as an officer in World War I.

A program worked out by such a committee (based upon recommendations of the FPC) should involve the issuance of passes for all employees both as a means of identification and as permits to enter plants and sub-stations. Such passes are usually numbered and carry a picture and sometimes the signature of the individual to whom issued. The plan of issuance calls for return of the identification card before a final paycheck is issued in case the employee leaves. Some utilities also have included the filling out of form sheets which incorporate a description of the employee, data on age, birthplace, etc., and fingerprints. These forms are forwarded to the FBI in Washington for filing in special confidential files set up for the purpose.

Closing of property to all visitors is another essential, particularly since the outbreak of war. Prior to that time some utilities had not exercised this precaution. Properties should be signed against trespassing. Most municipalities and counties have trespass laws which now are likely to be enforced strictly. Also there is a federal statute (Chapter 926 — Third Session — 76th Congress) which sets up severe penalties "to punish the willful injury or destruction of war material, or of war premises or utilities used in connection with war material . . ."

Employee training and employee education should not be overlooked. The anti-subversive program worked out by the Los Angeles Bureau of Power & Light included the training of 200 specially selected employees to function as special guards, and to take over the emergency repair of facilities damaged due to disaster or sabotage. Educational activities include constant warnings to employees to be on the lookout for subversive activities, suspicious characters, etc., with directions for immediately reporting any sabotage or attemped sabotage. In some instances certain employees such as line patrol-

men, ditch tenders, watchmen and others in the more remote sections of a utility system have been deputized and armed.

Security measures involving protective lighting are discussed elsewhere in this issue (See Page 42). Special lock systems have been installed on some properties and iron grills placed over windows. In certain instances openings such as windows have been bricked in, special heavy manhole covers installed and other precautionary steps taken.

Defense Measures

Passive defense measures, defined previously as steps necessary to minimize the effect of damage due to enemy action, constitute an entirely new field of security operation. Here British experience is of value and the following discussion is based upon study of British publications as reported in OCD publication "Bulletin No. 1—Protective Construction," and current British electrical magazines, principally *Electrical Review* (London).

It is recommended that an internal committee organization be established to study the utility's individual system as regards vulnerability as well as protective techniques and to recommend protective steps.

Aerial attack represents the major danger source. Hence a background relating to types and effects of bombs is essential in the consideration of protective steps that must be taken. In England the principal damage has come from demolition bombs, fragmentation bombs, incendiary bombs and aerial mines. It must be remembered that in bombing attacks, utility facilities represent a special target second only in importance to military objectives.

Effect of Bombs

Some conception of the problem of protecting facilities may be gained from a consideration of the energy involved in a bomb hit. In the case of a 1,000-lb. bomb falling 10,000 ft. the kinetic energy of impact is 9,000,000 ft.-lb. If the bomb detonates on contact, there is an additional kinetic energy release of the order of thirty times that of impact. The effect of the blast diminishes rapidly with distance. The blast has definite pressure-time characteristics. There is an initial momentary high pressure wave lasting 0.005 sec. followed by a negative "suction" pressure lasting 0.02 sec.

Damage results from penetration and fragmentation. Penetration will depend upon the shape, weight, dimensions, velocity, angle of impact, type of material hit and whether the fuse is of the instantaneous or delayed type. Fragmentation produces splinters with velocities in excess of rifle bullets. Fragments from a 500-lb. bomb are fatal at 200 yd. and will pierce brick or concrete walls 12 to 15 in. thick at 50 ft. At this distance they also will pierce 2-ft. earth or sand revetments built up between wood or corrugated iron sheathing.

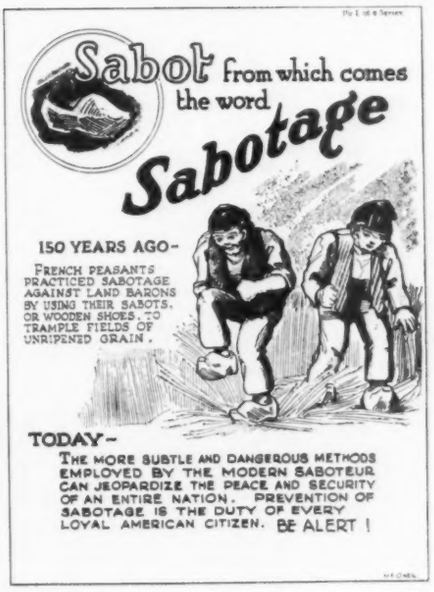
Two and 3-lb. incendiary bombs falling from a height of 15,000 ft. will pierce an ordinary 5-in. concrete roof.

Defense measures against aerial attack fall into two general categories: (1) preparatory steps to assure service continuity and to minimize damage, and (2) preparatory measures to expedite the restoration of service in case of serious damage.

Minimizing Damage

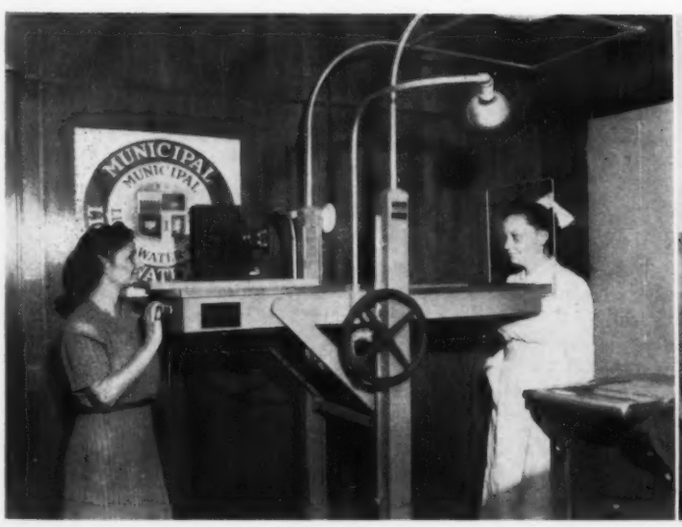
Several defensive measures fall in the first classification. In England system interconnection by means of the so-called grid has played an important role in assuring service continuity. System interconnection has been practiced on the Pacific Coast for years, and not only are individual systems interconnected at many different points, but adjacent systems also are tied together for power interchange. However, it is recommended that each system be studied with the idea of strengthening existing ties and establishing duplicate or triplicate energy sources in the case of important industrial areas.

Equally important is the maintenance of adequate communication facilities to all parts of the system. Both wire communication and radio is recommended. The importance of this not only has been demonstrated in England but also in recent years in southern California


Sabot from which comes the word
Sabotage
150 YEARS AGO-
FRENCH PEASANTS PRACTICED SABOTAGE AGAINST LAND BARONS BY USING THEIR SABOTS, OR WOODEN SHOES, TO TRAMPLE FIELDS OF UNRIPENED GRAIN.
TODAY-
THE MORE SUBTLE AND DANGEROUS METHODS EMPLOYED BY THE MODERN SABOTEUR CAN JEOPARDIZE THE PEACE AND SECURITY OF AN ENTIRE NATION. PREVENTION OF SABOTAGE IS THE DUTY OF EVERY LOYAL AMERICAN CITIZEN. BE ALERT !

Cartoons in the Bureau of Power & Light house organ are part of the constant anti-subversive educational program

Proper identification of all employees is an important anti-subversive measure Below (left) is a high-speed camera used by the Los Angeles Bureau of Power & Light and (right) filling out a questionnaire that includes fingerprints



Adequate fencing and proper signing are recommended. These Los Angeles Bureau of Power & Light men are setting signs warning against trespassing

at the time disastrous floods put utility facilities out of commission.

The strategic location of duplicate equipment and supplies with facilities for rapid transportation is recommended. Because of the multiplicity of systems in Britain, cooperative "pools" of such equipment were set up on which individual utilities might draw in case of damage. The borrowed material was replaced immediately if total destruction was involved; otherwise it was returned as soon as repairs could be effected. Principal items involved were switchgear, station transformers, conversion equipment (because of the amount of d.c. in use), etc.

Power Lines

Protective steps depend upon the vulnerability of and possible means of protection for various types of utility structures. Transmission and overhead distribution lines are relatively immune from damage. In the case of high lines destruction would only be possible under most favorable bombing conditions with planes flying low directly over the right-of-way. Damage might result from the destruction of a single tower. In such a case the erection of a "shoo-fly" would be an easy matter. Principal line damage in England has resulted to insulators and tower members from flying bomb fragments or structural members of adjacent buildings struck by bombs.

Overhead distribution lines might suffer similar damage except that transformers also are vulnerable to bomb fragments with the added possibility of fire, due to oil leakage. However, such damage can be repaired quickly as has been demonstrated time and again in the case of severe storms when line crews have replaced and rebuilt large sections of line in record time.

Underground distribution facilities present a different problem. British utilities have gained valuable experience with such systems because of the concentrated attacks on metropolitan areas where most service is underground. One pleasant aspect has been the manner in which modern cables have stood up under bombing. A recent issue of *Electrical Review* reports:

"Actually, however, experience has shown that paper-insulated, lead-sheathed and armored cable stands up to very severe damage, irrespective of voltage, and we may mention that in one instance it was the electric cables that held up a damaged bridge.

"Numerous instances have occurred where the cables, depressed and twisted many feet below the laid level, have not failed. From observations made in these cases it has sometimes, although not always, been found that the stretching of the cables laid direct in the ground has been confined to the length of cable in the crater, and does not extend any appreciable distance on either side. Frequently any slack in existence in adjacent manholes has been sufficient to prevent damage of the joints . . . ."

For quick repair pre-built junction boxes in which connections can be made coupled with quick congealing cable compound have been found most effective. A stock of sections of various sizes of cable is also maintained at strategic locations.

Massive concrete dams are not likely to suffer damage from aerial bombardment, although headgates, spillways, intake screens and their operating mechanisms may be damaged. Such installations require individual study. They can be protected partially by the construction of reinforced concrete shields.

Power Plants and Substations

One immediate danger to power plants, substations and similar structures has been partially removed by the fire-resistant construction employed by Western power utilities. The danger from fire results mainly from damage to oil-filled equipment such as breakers and transformers. In England protection of such equipment has been achieved by the erection of sandbag walls or sand-filled iron sheaths around such equipment. This protects against either bomb fragments or flying structural members. Protection against incendiary bombs has been provided by the erection of sloping "Durasteel" hoods over the equipment. This will usually deflect the bomb away from the apparatus. Similar hoods have been placed over switchboards and metal enclosed switchgear with excellent results.

Rotating machinery also has been protected with sandbag walls or other forms of revetment. Where possible some form of screen or cover is desirable to protect open rotating machinery from flying glass or other debris in case of a bomb hit or even a near miss. It is suggested that skylights and windows be protected against shattering (see article on blackouts, page 29). In attended stations that must be blacked out in case of air raid alarms, it is suggested that generous use be made of luminous paint. Essential switch handles, instruments and other necessary equipment can be treated with this type of coating.

Adequate fire fighting equipment is essential and in large stations an organization of trained personnel to fight fire is recommended. Steps should be taken to see that civil defense emergency fire fighting crews do not tackle plant or substation fires where live equipment is in service. Otherwise serious injury might result.

Careful attention should be paid to the storage of highly inflammable liquids of any character. Where such storage is essential, study should be made as regards placing the tanks underground or removing them to a less dangerous place than in the power plant or substation.

Analysis of individual conditions on the various Western utility systems by men who have made a study of precautionary procedure will indicate possibilities of passive defense measures.

Questions and Answers

This department has been set up to answer technical queries submitted to the "experts" in the recent PCEA quizzes and to give the answers to questions sent to the editors from time to time. Reader's queries will be submitted to men best qualified to answer them, as were those turned in during the "Information Please" quiz

QUESTION: *What is the best method for detecting defective high-voltage bushings in service before failure occurs?*

ANSWER: Thus far there has been no positive test developed which will indicate, beyond question, the condition of a high-voltage bushing. Most promising method and one which is continually finding wider acceptance among those who are interested in the condition of electrical insulation is the measurement of dielectric loss and power factor of the insulation in question.

Two factors have a bearing on this method of checking the condition of insulating material: (1) the method of making power factor measurements, and (2) in interpretation of the results. The power factors to be measured are very small in value and accurate results can only be obtained with equipment which approaches laboratory standards in its quality. This type of equipment does not lend itself readily to the testing of apparatus in service.

Interpretation of the power factor measurements must rest upon the experience gained from many tests and a value must be set up to establish the dividing line between insulation which is known to be good and that which is open to question. The securing of data from a sufficient number of tests to establish minimum standards for acceptable insulation requires time both for the actual testing and for developing the insulation failures in service which will enable establishment of "dead line" values.

For those interested there is recommended a descriptive article by the manufacturer and patentee of one type of apparatus for measuring dielectric loss and power factor of insulation in the October, 1941, issue of *Electrical Engineering*, pages 934-939 of the Transactions Section. In the same issue, pages 940-942, is an article entitled "Bushing Tests" which gives additional information.

QUESTION: *Does hysteresis occur in low voltage transformers?*

ANSWER: The hysteresis loss in a transformer core takes the form of heat. It represents the energy used to turn the molecules of iron on their axes every half cycle. It is a function of the flux density, or number of magnetic lines per square inch section of the core. Hysteresis, therefore, occurs in transformers without reference to their voltage ratings, since the magnetic design merely relates to the voltage per turn and the respective coil voltages are entirely a matter of choice of number of turns.

QUESTION: *Explain fully the "Impedance %" of a transformer, both station and distribution types.*

ANSWER: The impedance percentage of a transformer is the percentage of its normal rated voltage applied to one winding in order to force full load current through both windings, the other winding being shorted at its terminal.

The impedance voltage is made up of two components: (1) the resistance drop in phase with the current, and (2) the reactance drop which depends on the magnetic leakage between the windings and is 90 deg. out of phase with the current.

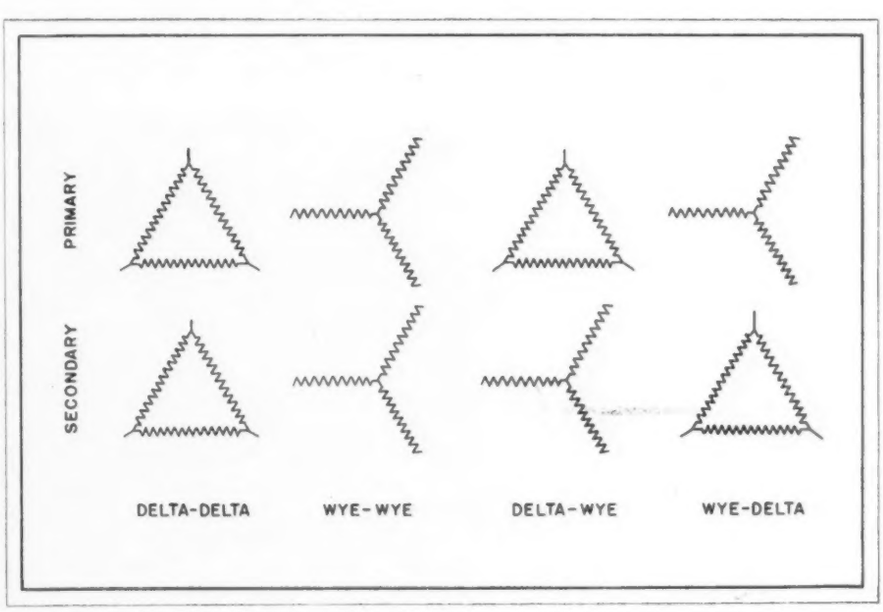
In station transformers the reactance drop will be perhaps 10 to 15 times the resistance drop in order to hold down short circuit forces on the coils. In distribution transformers the reactance drop will perhaps be only one to five times the resistance drop in order to maintain good voltage regulation, particularly at power factors below 100%. With respect to short-circuit forces the inherent mechanical strength of small transformers is high. Moreover, line drop will greatly reduce the possible current under short-circuit conditions.

QUESTION: *Discuss the merits of paralleling or banking transformers on secondary rather than keeping 120/240-volt secondaries separated.*

ANSWER: The advantages of banking distribution transformer secondaries are reduction of light flicker, improved transformer loading and increased continuity of service. Banking may be effected by forming a secondary network or grid, or by merely connecting secondaries progressively down each street with no cross ties between streets.

Careful design is necessary on a system using banked secondaries if cascading of fuses is to be avoided. Transformers must all be within one or two sizes of the same rating, and all fuses must be carefully coordinated. Extreme care is necessary on the part of linemen in handling banked transformers, because the blowing of fuses on either the high or low voltage side still leaves a transformer "hot."

Question—Draw diagrams of the following transformer connections: delta - delta, star - star, delta - star and star - delta



Regulators Aid Sodium Lighting Operation

Operating data on Tacoma sodium vapor highway lighting installations show desirability of this type of illumination with proper regulation

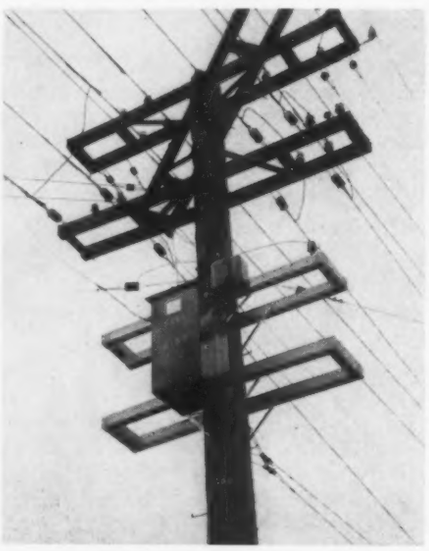
By Philip A. Brown
Assistant Electrical Engineer,
Tacoma Light Department

OPERATING records, as well as accident records on the highway sections under lights, speak well for sodium vapor lighting in and around Tacoma, Wash. The systems described below were completed several months ago by the City of Tacoma Light Division, so that operating data have acquired significance.

Having special technical interest is the installation on the Pacific Highway within the city, employing a non-moving-coil type of constant-current regulator. This installation is divided into four sections, all controlled by one photo-electric relay, and employs both General Electric and Westinghouse sodium lamps. The complete circuit, as well as that of the regulator are illustrated.

In order that the lamps could be serviced from a pole rather than from a ladder truck, trolley-type mast arms were used throughout. For most of the installation, existing wood poles were employed.

The regulator referred to has the advantage of requiring much less line current than do the older types, this desirable situation being the result of high efficiency and excellent power factor for values ranging from 25% load up to overloads. Obviously, copper losses in the supply line are thus materially reduced.



The non-moving coil type constant-current regulators are mounted on poles

When the loop load is non-inductive, the power factor of the current feeding this regulator is unity. Furthermore, if the loop contains inductive apparatus, such as isolating series transformers, for example, the power factor in the supply line is leading.

This good power factor, together with the reduced current draw, mentioned above, results in greatly improved voltage regulation. In addition, the transformers are lighter in weight than moving-coil types and thus require less ponderous poles, crossarms and hangers to support them.

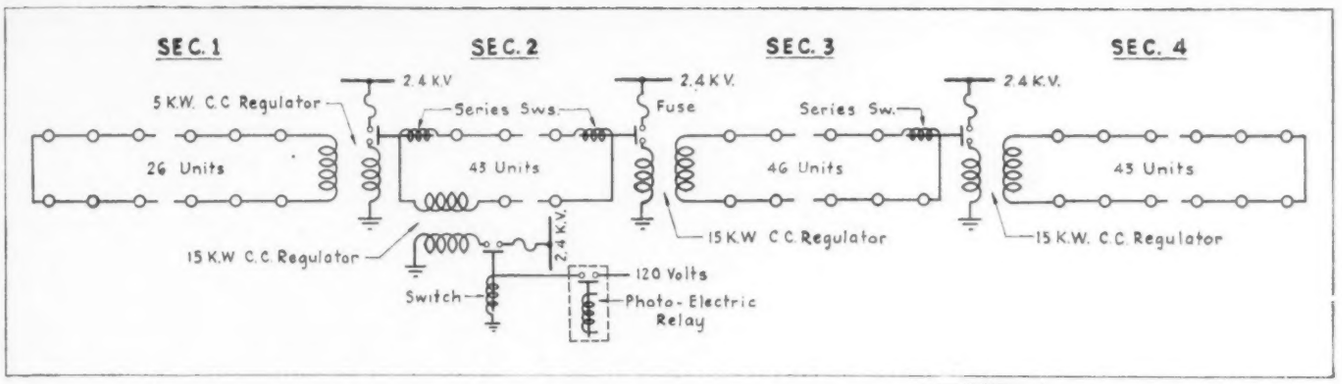
Prior to installation, the transformers were connected in the shop to a load equal to that which they would carry when installed, and were adjusted to this load. They were then installed, being connected to regulated primary feeders.

Such regulators are now being manufactured by Wagner Electric Co.

A second sodium system was installed just east of Tacoma, on the Pacific Highway toward Seattle. Material was purchased by the State Highway Department (which bore the cost of the job) and installed by Tacoma City Light.

The installation involved new wood poles and Copperweld No. 6 wire throughout. It is likewise photo-electric controlled and utilizes both General Electric and Westinghouse luminaires (6.6-amp.) The regulators are 6.6-amp., moving-coil type, connected

Typical of the lighting on the state highway east of Tacoma is the view below (left); other view is of East 26th Street



across a 4,160-volt primary regulated feeder.

The design which was decided upon —using a 16-ft. arm to support the luminaire—brought the units to a point 25 ft. above, and 2 ft. outside of, the edge of the pavement. The nature of the highway (width of shoulder, etc.) made this the closest practicable distance. One exception to this type of construction was employed at an intersection where it was desired that poles be kept farther back, and where the units were suspended on messenger wires.

The third system, which is south of the city, also on the Pacific Highway, has been in operation for three years. It is substantially the same in design, except that the highway there requires extra long mast arms to keep the poles well back, and the units are above a point approximately 3 ft. outside the edge of the pavement.

A summary of data for the three systems is shown in the table.

Operation

Cost of operation of the city section is about $800 per mile per year. That of the highway section is about $830 per mile per year. The difference is accounted for by the fact that the highway section is on its own pole line. Replacement of lamp supports there is charged directly to the street lighting system. Within the city, however, the units are mounted on power distribution poles, and replacement of supports is charged to the power distribution system.

Lamp life of one make of lamp has averaged 2,051 hours, 51 hours in excess of the guarantee. One lamp on the city system is still burning at 4,800 hours, a fact which speaks well for the non-moving-coil regulator as well as for the lamp.

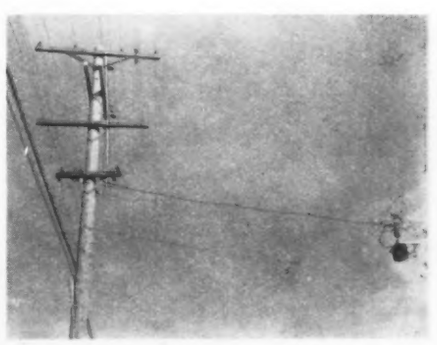
Actual consumption for the 66 units on the older system south of the city was 83,100 kw.-hr. in one year. Throughout a 19-month period, 165 lamps were replaced, representing an average life of 2,155 hours for each lamp.

The Pacific Highway lighting system is divided into four sections with four regulators and photo-electric relay control as shown above. At the right is pictured a typical trolley-type mast arm luminaire installation east of Tacoma.

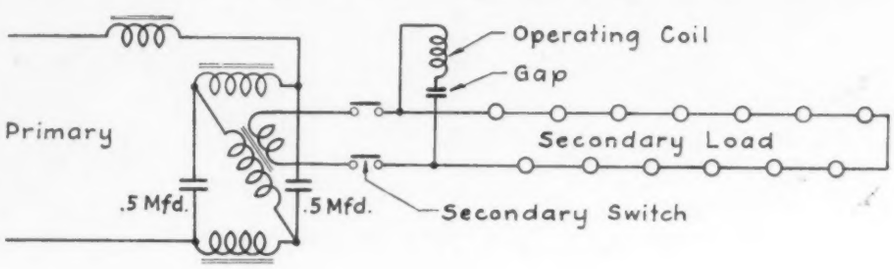
These installations are not ideal. There are dark spots between units at the spacing used, and in foggy weather, which is prevalent at certain times of year, the lights act merely as a guide. But they are a remarkable improvement over no light at all. It is hard to make strict comparisons of night safety, harder still to attribute traffic accidents to a specific cause. But it seems highly probable that the lights can be credited at least in part with the fact that subsequent to installation night traffic accidents in these three sections have been decidedly reduced.

Sodium Vapor Lighting—Operating Data

	IN TACOMA	SOUTH OF CITY	EAST OF CITY
Length (miles)	5.5	2.5	3.1
Size of units	10,000	10,000	10,000
Mounting height (ft.)	25	25	25
Arrangement	Staggered	Staggered	Staggered
Spacing (ft.)	200	232	200
Number of units	158	66	87
Circuit	Series	Series IL Tr.	Series
Mounting	Wood Poles	Wood Poles	Wood Poles
Arms	Trolley	Fixed	Trolley
Total cost	$24,621	$11,995	$15,431
Unit cost	$155	$181	$177
Cost per mile	$4,475	$4,790	$4,910



Mono-cyclic square is the designation given the circuit of the non-moving coil type constant current regulator shown below. A messenger cable installation of one sodium vapor unit is shown at right



Unit Substation

Economy, mobility of unit type sub decides East. Ore. L & P Baker Job

THE CHOICE of a unit type substation for adding capacity to the Baker, Oregon substation of the Eastern Oregon Light & Power Company was materially influenced first, by economic considerations and, second, by the versatility and mobility of such a unit, particularly as it could be applied to future load requirements and the shifting of load centers.

To grasp the economic problem a statement of conditions existing before the installation of the new unit must be made. The city was served by one 2,000-kva., 66,000/4,000-volt transformer bank and one 1,200-kva., 22,000/4,000-volt transformer bank. The city load at that time approximated 2,600 kva. and as the 66-kv. bank furnished power to other parts of the system through the 22-kv. bank, it was overloaded during the winter months. It was decided that the best way of alleviating the load on the 66-kv. bank would be to remove a substantial portion of the existing city load from this bank.

The substation building was designed in such a manner that ample space was allowed inside the building for additional voltage regulators, bus work and feeder control panels. It was found, however, that the cost of adding a 1,000-kva. transformer, a 66-kv. outdoor oil circuit breaker, indoor voltage regulators, a feeder circuit breaker and the necessary bus work additions would be between five and ten per cent more than an outdoor, unit-type substation of equal capacity installed in the substation yard.

The factor of versatility and mobility of equipment affected this problem more than would usually be anticipated because the major residential load growth of Baker, due to physical conditions, will be in the direction away from the present substation. The 66-kv. transmission line traverses this area of future load growth so that when it again becomes necessary to increase the capacity of the Baker Substation, larger transformers suitable to the future requirements may be installed at the main substation and the unit substation moved near the load center of the then existing residential section.

The foregoing presents briefly the basic factors governing the selection of the unit type substation instead of the conventional transformers, circuit breaker and regulator installation. The unit installed was a Westinghouse Type CSP unit substation. The new unit fitted admirably into the existing switchyard. The two feeders were brought out to the terminal box on the secondary side of the transformer. The capacity of this unit may be increased to 1,250 kva. at any future time by the addition of inexpensive air blast equipment.

The installation presented no major problems. The unit was shipped on a flatcar without oil. The oil was removed from the transformer at the factory because the lack of heavy transportation and handling facilities in this area limited the weight that could readily be handled. The transformer was moved from the flatcar to a large trailer, towed to the substation yard where a concrete base had been prepared and slid off the trailer to the base by means of greased steel rails.

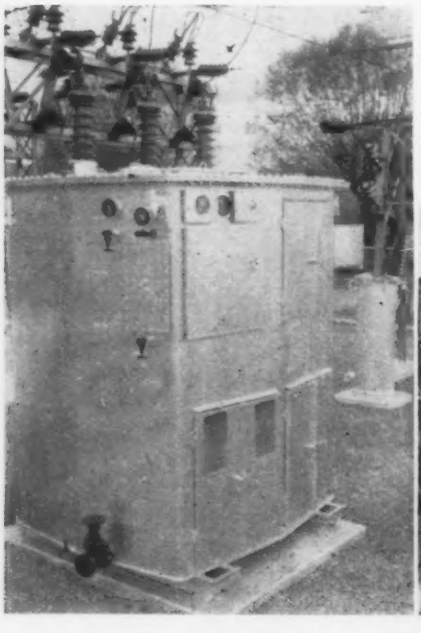
The unit was then filled with oil, connected to the primary and secondary lines, tested and placed in service. It has been in service over six months without the operation of the low voltage circuit breaker. The growth of load since the installation of the unit substation has been greater than anticipated and the spare capacity afforded by this unit will be used to good advantage during the present period of national emergency.

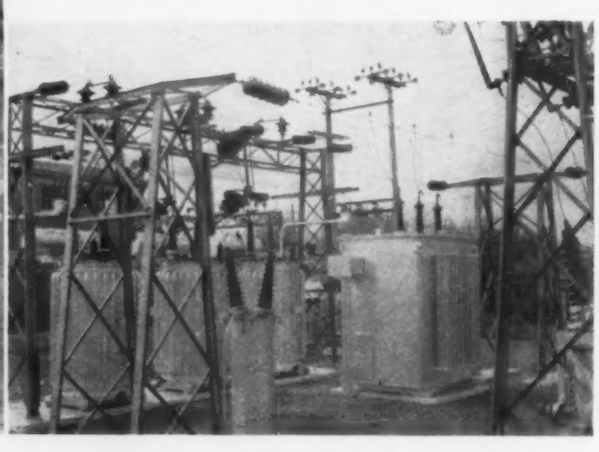
Fulchronograph

Among seven lightning strokes hitting the 585-ft. Anaconda smelter stack of the Anaconda Copper Mining Co., was one exceeding the 160,000-amp. measuring ability of the fulchronograph installed at the bottom of the stack and a second which was made up of 22 separate surges. These facts were revealed as the second lightning season closed during which the Montana Power Co. and the Westinghouse Electric & Manufacturing Co. have conducted cooperative studies of lightning intensities.

Two years ago fulcronographs for measuring values of lightning strokes were installed at the base of the Anaconda and Great Falls smelter stacks. At Anaconda the device is connected through two cables to a 60-ft. diameter copper ring on top of the stack. Twenty vertical 1-in. copper rods protrude from the ring 5 ft. into the air.

The studies are part of a nation-wide investigation of lightning being conducted cooperatively.





Versatility and mobility plus an estimated ten percent favorable cost differential influenced the selection of the 1,000-kva. unit substation (left) installed at the Baker station of the Eastern Oregon Light & Power Co. When load conditions warrant, larger transformers will be intalled at the main substation and the unit sub moved to a point closer to the load center. Picture at the right shows how the unit fitted into the substation yard and how the two feeders were brought out to the terminal box on the secondary side of the transformer. Future installation of air blast equipment will give the unit a 25 percent overload capacity. Ease of installation is an advantage of this type of equipment in that connections are simplified. In many instances such a unit sub may be unloaded, transported to its site, set up and put in service in a single day. This factor along with mobility, make these units practical in serving transitory defense loads.

Adequate Lighting for Plant Protection

By Major Lindsay M. Applegate
Corps of Engineers,
San Francisco District

PROTECTIVE LIGHTING as an element of national defense has yet to encounter an extensive test. So far, during the present emergency, sabotage has been practically negligible, but if it should become serious the design of protective lighting will become a vital problem.

The basic requirement of protective lighting is that it facilitate observation. Secondary requirements are that the lighting assist in misleading the intruder and in inconveniencing his operations. Under any circumstances, lighting should not assist the intruder.

To facilitate observation, light should, if practicable, be directed from the guard to the intruder. Each guard should be free to traverse his entire beat in relative darkness. He should be able to observe all avenues of approach to his area without any interfering glare of light. He should be as nearly invisible to intruders as possible. The best arrangement of light from the guard's point of view is that of floodlights mounted 15 ft. or more above the ground directed outward toward a good field of view through which an intruder would have to pass to enter the guarded area. The second best arrangement is that of modern street lights illuminating the intruder's approach.

The intruder is inhibited in his movements both by illumination and glare. He can see past glaring lights by looking through pieces of pipe or mailing tubes to shade his eyes, but if he has to approach through an illuminated area, the use of such an expedient is likely to be limited to the outer margin of the area. Thus, while illumination is of first importance, glare adds to the intruder's difficulties. He is further handicapped if, in the areas where he expects to work, the illumination is irregular and deceptive.

The design of the lighting arrangements should be dependent upon the character of the installations to be protected. The question of whether or not a particular part of an installation ought to be illuminated should always be given careful consideration. The criterion should be: will the light accomplish any useful purpose? If it is not needed, the light should not be wasted, especially when it may give direction to an intruder. Consider, for example, a transformer station.

PROTECTIVE lighting should be used only where it is definitely necessary and where it will positively increase the efficiency of guards or displace some guards. Installations should be completely and fully coordinated with other protective measures. Incomplete installations, especially where the lights will serve as markers near critical areas, should be avoided. Lighting in interior areas, where routine work is carried on, should be lighted with street lights, and street lights, except in unimportant areas, should be modern closed types with 6,000-lumen lamps operating in series on 6.6 ampere series circuits. Flood lighting of small areas at short ranges can be accomplished with 750 or 1,000 watt lights with 30 deg. beam spread. Flood lighting where long ranges are necessary should be done with copper-cased lights with silvered glass reflectors. These lights should have a beam spread of about 13x44 deg. with 1,000-watt G-Type lamps. Flood lighting of extensive areas at short ranges should be done with Fresnel 180 deg. lights equipped with 6,000 lumen street lamps, 6.6 amp. circuit.

Power companies usually illuminate substations for two reasons, the most important of which is to attract favorable public attention. The lesser reason is to prevent tampering by irresponsible persons. This type of lighting is sufficient for ordinary municipal police observation but it is in no degree adequate or suitable for protection from seriously planned sabotage. The simplest and most obvious means of damaging electrical installations is rifle fire, as every power company has learned from experience in times of peace. With this fact in mind does it appear desirable to illuminate the substation like a target in a shooting gallery? On the contrary, substations should be made as inconspicuous as possible. This is especially true if the station is not continuously guarded. If it is guarded, the light should be put not on the protected equipment, but on the places where the saboteur is most likely to go in order to commit his depredations.

The same principle applies to the protection of other installations, although there are not many types of plant where a single rifle bullet can do as much damage as one properly placed in an electrical machine. The light in any case, however, should be on the intruder or on the places where he is likely to be during his approach rather than on the protected plant.

There are four principal types of illuminating equipment for protective lighting each of which is particularly adaptable to specific applications. These are: street lights, 180-deg. Fresnel lens units, floodlights and search lights. The application of these types of luminaire is illustrated in Fig. 1, a generalized layout of an industrial plant.

In this layout all four types of illumination are provided. Along the street and the railroad where glare would be objectionable street lights are used. Street lights are also used in the yard for general illumination. It is, of course, immaterial for close-up illumination whether broad-beam floodlights or street lights are used. The selection will depend on special local conditions, availability of materials, and cost, but experience indicates that street lights are usually more economical and efficient for general illumination than floodlights. Along the south side of the plant, floodlights are mounted on the buildings. These are designed to illuminate a range of ground sufficiently large to make it difficult for an intruder to approach unseen. On the west side the plant yard is illuminated for work and the fence is illuminated by Fresnel 180-deg. lens units. Towers with searchlights are placed at points on the buildings from which as much of the surrounding areas as possible can be seen.

In industrial plants of the kind illustrated in Fig. 1 there is little opportunity for deceptive lighting. The plant, which is necessarily illuminated, is

easily distinguished so the principal objective of the protective illumination is the intruder. In isolated substations the situation is different. Here there is no inherent necessity for lighting the substation, so the protective lighting should be designed to deceive the intruder if possible as well as to force him to expose himself. An illustration of one way of doing this is shown in Fig. 2. Here the substation is shown near a highway. The station is camouflaged by a small building between it and the highway. This may be used as a permanent guard house if the station is of enough importance, or it may be visited occasionally by a patrolman. Facing the highway and situated so as to obscure the station as much as possible from the road there are sign boards with high intensity illumination. Commercial advertising or patriotic appeals should be used as may be appropriate to the location. Around the substation building and sign boards, trees and shrubs should be arranged, apparently for roadside decoration, actually so that a guard in his usual beat can observe the highway and the substation without himself being conspicuous.

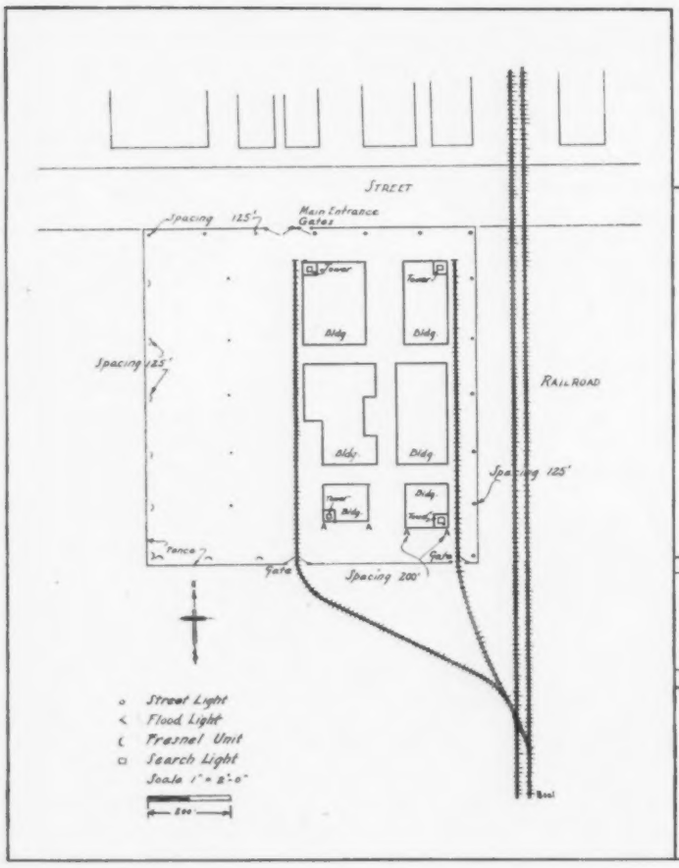
The lighting should be widely distributed in the vicinity and of high intensity and arranged to attract attention to objects other than the substation. While this will not deceive all saboteurs, it will diminish prompt recognition of the substation during reconnaisance from the highway. It will also prevent direct observation of the substation from nearby points from which a rifle attack might be made. The presence of the trees and structures will give material protection without being obviously part of a protective installation. The luminaires in a situation of this kind must appear to be commonplace to avoid attracting attention. Ordinary looking sign and street lights should be used. Imagination and skill must be used to get the desired illumination without its being suggestive of camouflage. Where elaborate measures of protection for the substation are not practicable, the best course of action is to leave it completely dark at night as if it were the least important installation in the vicinity.

These two examples indicate in general the methods of lighting for protection. The variations are infinite and each problem has to be treated to suit the local conditions. In all problems, however, the technique of use of the luminaires can follow recognized illumination engineering practice. There is one rule applicable to all installations: The illumination on the intruder at the outer edge of the protective illumination should be at least 0.1 ft.-candle (0.1 lumen per sq. ft.). In the greater part of the area under observation the illumination should be 0.5 ft.-candle.

Street light application data are available in the IES "Recommended Practice of Street Lighting" and in manufacturers' publications. Boiled down to a single rule it may be said that a row of modern 6,000-lumen enclosed street lights spaced from 100 to 150 ft. will provide illumination averaging 0.5 ft.-candle in a strip between 50 and 100 ft. wide. For estimating costs of street light installations, $50 per 100 ft. is a reasonable figure.

Fresnel 180-deg. lens units are a species of floodlights. They produce a beam with a horizontal spread of nearly 180-deg. and a vertical spread of about 18 deg. Equipped with 6,000-lumen lamps and mounted 15 ft. from the ground at 125-ft. intervals they can produce vertical illumination of 0.5 ft.-candle 120 ft. away. These lights are furnished either for series or multiple service. The series lamp is to be preferred because of its short vertical filament, which is more efficient in this type of unit than the larger multiple type filament, and also because of its longer life. The cost of an installation of these may be estimated at the same price per 100 ft. of illuminated strip as for street lights.

Floodlights used to come in a variety of shapes and sizes. The present restrictions on the use of metals has made many types temporarily unaviilable, but one remaining form, as long as it is available, will give good results. This



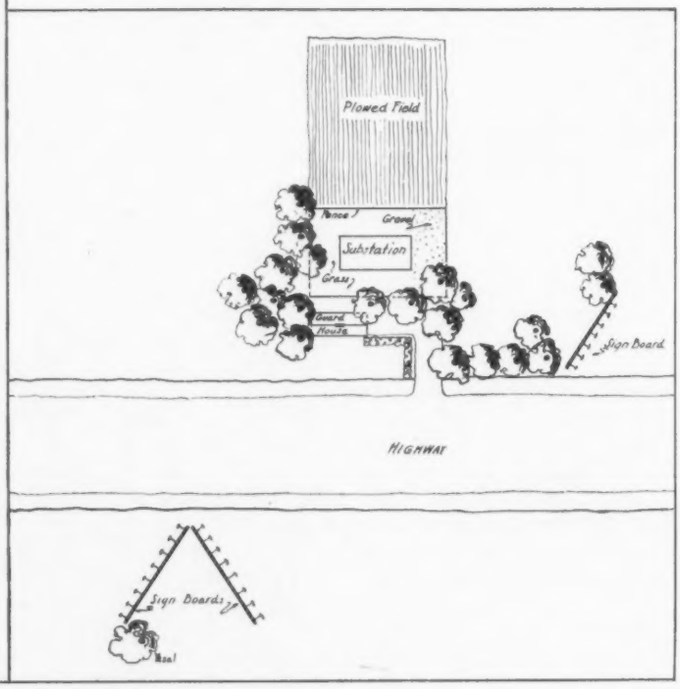


Fig. 1 (left) shows a conventional protective lighting installation for a typical factory using street lighting luminaries, fresnal lens units, floodlights and search-lights

Fig. 2 (below) shows a protective layout for a substation

is a drawn-copper cased lamp with a silvered glass reflector. Recent developments in reflectors have produced baked porcelain backings that last far longer than the older backings and these can now be depended on for long and efficient service. These floodlights can be obtained with plain and "spread-light" lenses. They cost about $50 each in the 1,000-watt size.

Floodlight installations have to be designed to fit local conditions. For this, approximate formulas giving the "range" of circular beam and spread beam lights have been developed.[1] For circular and spread beams the ranges in feet are respectively:

$$R_c = \frac{\sqrt{\frac{4L}{\pi I}}}{2 \tan \frac{a}{2}}$$

and

$$R_s = \sqrt{\frac{L}{4I\left(\tan \frac{h}{2} \tan \frac{W}{2}\right)}}$$

where L is the light output in lumens,
I is the specified intensity in foot candles,
a is the angular spread of the circular beam in degrees,
h is the vertical angle of spread in degrees of the spread beam, and
w is the horizontal angle of spread.

The application of these formulas is illustrated in Fig. 3 which presents a comparison of a circular beam and two spread beams of the same total lumens. The circular beam is that of a conventional floodlight rated 1,000 watts with a 21-deg. angular spread obtainable with a general purpose PS-52 type lamp. The 1,000-watt spread beam with a vertical angle of 21 deg. and a horizontal angle of 53 deg. is obtainable from the same floodlight when equipped with a spread lens and a PS-52 lamp, or a beam 13 deg. by 44 deg. can be had with a floodlight G-40 type lamp. The light in the beam in all three combinations is about 8,600 lumens. Using the formulas to get the range at which the vertical intensity of illumination is 0.5 ft.-candles and drawing the beams to scale produces the results shown. The favorable range and distribution of light in the 13 deg. by 44 deg. beam often justifies the use of the G-type lamp although of higher cost and shorter life.

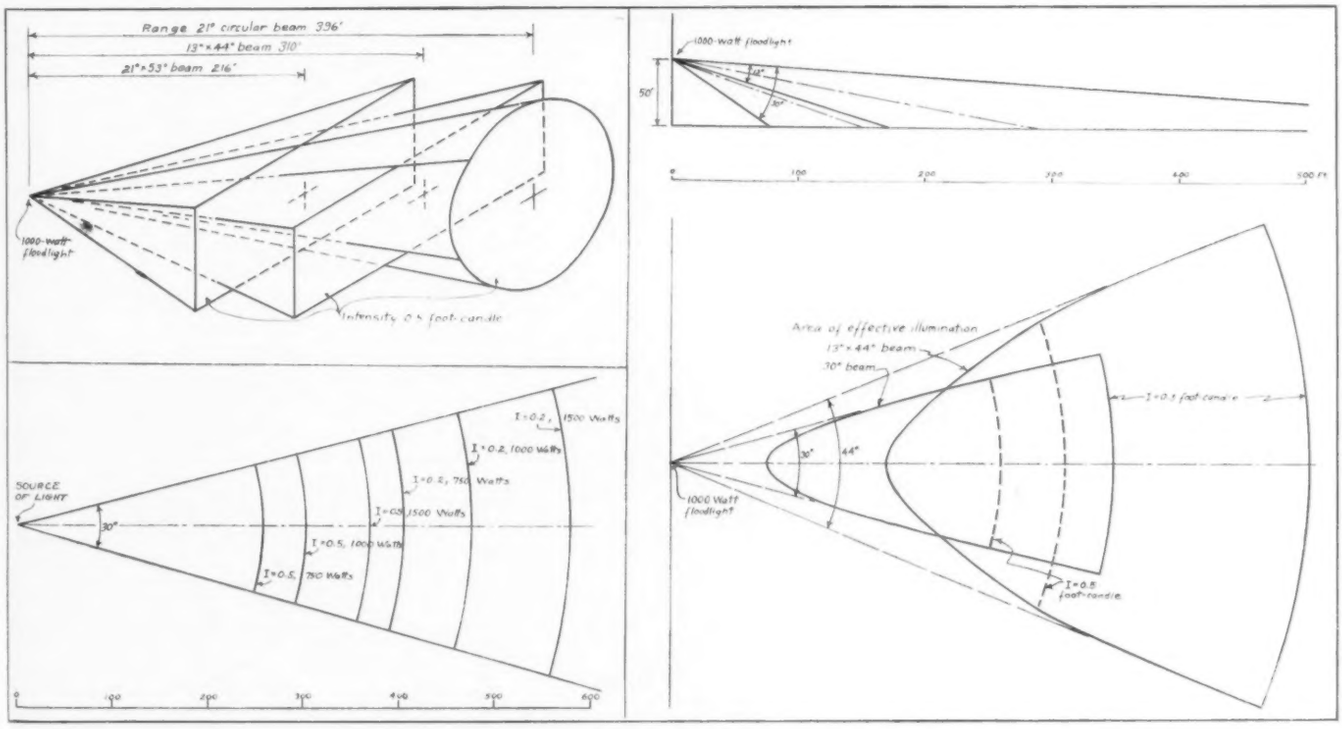
Diagrams of this kind can be developed into templates representing vertical and horizontal beam sections. Fig. 4 shows a template for a circular beam floodlight with a 30-deg. spread equipped with three sizes of light and for intensities of 0.2 and 0.5 ft.-candles. A comparison of templates is illustrated in Fig. 5 which shows vertical and horizontal templates for 30 deg. and 13 deg. by 44 deg. beams superimposed. From this comparison it is evident that for ranges exceeding about 200-ft. beam lights have to be used to get acceptable light intensities. This leads to a rule that is useful: For flood light illumination close to the light an ordinary 30-deg. circular beam is satisfactory. For glaring illumination at ranges up to about 150 ft. the Fresnel unit is suitable. For illumination at ranges beyond 200 ft. the spread beam floodlight should be used.

Searchlight beams can be compared for range and size of spot the same as a floodlight, using the formulas given. Searchlight beams to be effective should have a spread of 5 deg. or less.

In designing any installation of protective lighting the designer should keep in mind the fact that the saboteur may be an intelligent man. He should try to see the weaknesses of his design from the point of view of an engineer ingeniously planning destructive action. He must in any case avoid putting light where it will help the intruder, especially when it will not help the guard, or when no guard is present.

1 Applegate, Maj. L. M., Q.M.C.: Protective Lighting, *Quartermaster Review*, September, 1041.

Fig. 3 (top left below) presents a comparison of a circular and two spread beams, all with the same total lumens. Fig. 4 (bottom left below) shows a template for a circular beam floodlight. Fig. 5 (right below) shows superimposed vertical and horizontal templates for three different lens with the same lamp



Home Service Training is a Parade

Matrimony picks off the well trained home advisor girls almost as fast as they can be prepared but it is all worth while

IT takes a wise sales manager these days to determine what's good and what is bad in the matter of personnel. Feminine frills and charms present the same enigma in business that appeared in romantic stories of old. For instance, twelve of the 19 home service advisers in the Washington Water Power Co. left in one year for matrimonial reasons.

The fact that they are now numbered among housewife enthusiasts for electrical service is good; the fact that employe turnover reaches perplexing proportions is bad. If all the advice regarding points to watch in hiring a home service adviser were laid end to end and recorded, this brief story of department procedure would not be written. Girls would still be girls.

There are, it must be admitted, certain disadvantages in hiring vivacious girls to carry on home service duties. Again, there are advantages. A friendly, feminine smile does much to persuade the dealer and dealer salesmen to support a merchandising program or a sales training class. Girls fresh from college and desirous of making good in business often work harder to achieve results than would an older woman.

They seem to take responsibilities seriously. Also, they show less fatigue; do less complaining and can be taught new methods with less effort. Choosing advisers with unsymmetrical lines and unorthodox visages, we repeat, may have disadvantages, but the woman who is slowed down with a touch of arthritis or disillusionment also brings occasional headaches.

In selecting its home service personnel, the Washington Water Power Co. appeals to local universities and colleges, where home economics departments are more and more inclined to feature correlating activities for utility work, such as demonstrating, lecture methods and theory as it pertains to diet, lighting, menus and home decoration. At specific periods of the year, department heads in various schools are invited to select young hopefuls for the company's training period. It is understood that a fixed number of these applicants will be taken on by the company and given permanent employment if they survive the training period.

Training of the future home service adviser is usually done in company office quarters. The first day usually promises an aptitude test designed to measure personality traits important in sales activities. Then comes an explanation of the company organization, home service duties, and the mysteries of dealer contacts.

With this background, the prospective advisers begin training, including practical projects, lecture, films and a good deal of reading. The course ends with the supervisor watching every gesture and inflection to determine whether the young lady be considered an expert demonstrator in cooking, lighting, etc., and a well-informed young lady on all subjects pertaining to the electric industry.

Careful training in voice, manner of expression, by recording and playback

Is it any wonder that these model homemakers are soon wearing diamond rings? Young men with fond recollections of womanhood in grandmother's day find it impossible to resist good cooking, the pleasantries of good management, not to mention occasional pulchritude.

Sales managers who come into headquarters to look over the season's crop and select a girl or two for his divisions, keeps these frailties in mind. But no amount of psychic insight seems to predict the future. Whether the girls be tall or short, a bit plump or thin, matrimony will get them if they don't watch out.

Home service advisers in the Washington Water Power Co., directed by the capable department head, Lucile Ramirez, told a story of good light and better living on 23,200 home service calls. These capable but youthful girls conducted 752 demonstrations, with a total attendance of 37,634; and conducted 104 dealer sales training courses.

As to public relations, the friendly manner, the helpful attitude of these girls is worth all they cost. They may not stay long with the company's service, they may wear a diamond the first month after they begin to circulate, they may even get married and settle down. But from the standpoint of company boosters, that's still a step in the right direction.

Business Guide →

Events cause change. Advent of actual war will make necessary a change in dealers' and salesmen's methods too. Emphasis will be shifted to aid in the defense and war efforts of the nation. It seemed appropriate to *Electrical West* that its own efforts be directed to aid dealers and salesmen make these business changes by bringing them the soundest, most practical advice available. For that reason *Electrical West's* dealer *Sales Guide*, published continuously since 1935, will become a *Business Guide*, as well as a Sales Guide.

Taking a long range view of the business picture, seeking out the most capable advisors, *Electrical West* will present for dealers and salesmen in concise, useful, down-to-earth form, the ideas and methods, yes and the philosophy, needed by the dealer and salesman for survival and service in this war environment. The first of the 1942 series on the facing page treats of Light Conditioning but from the very realistic angle of being sure that a home is properly blacked out first so that light may be enjoyed and used.

A new service will be a series of short, to-the-point articles by Ken Hampton, giving the underlying philosophy behind merchandising. In a world which questions the American way of conducting private business, these articles should be given to every new salesperson to read and digest in order to understand what selling is all about and why it is still necessary and desirable. Hampton, merchandise manager of Valley Electrical Supply Co., Fresno, knows the subject, has real experience to contribute, has accounting training, and has actually helped many dealers to pull through hard times. It won't do the hardened old veteran salesmen and dealers any harm to read these articles too.

Electrical West

Business Guide

For Electrical Dealers and Salesmen

Light—in spite of the Blackout

At first glance there may seem little hope for the electrical dealer to continue the selling of lamps and light conditioning equipment to the home when war brings the Blackout to the country. Such drastic curtailment of outdoor lighting, window lighting and signs has been ordered by the army that it would be natural to suppose no lighting was to be permitted at all.

Yet it is highly desirable that the home continue to be well lighted, but that such lighting not be permitted to escape and be seen outside. For the first few blackouts people may be content to wait in the dark until it is over. But if blackouts are to be numerous or of long duration (and with the kind of enemy the nation is fighting it does not pay to take any chances) means will be wanted to continue to have lighting indoors as long as it does not show from the outside.

The alert electrical dealer, already selling Light Conditioning, will extend his service to include advice on the blacking out and screening of the homes of his customers in order that they may really enjoy the light conditioning he has to sell them.

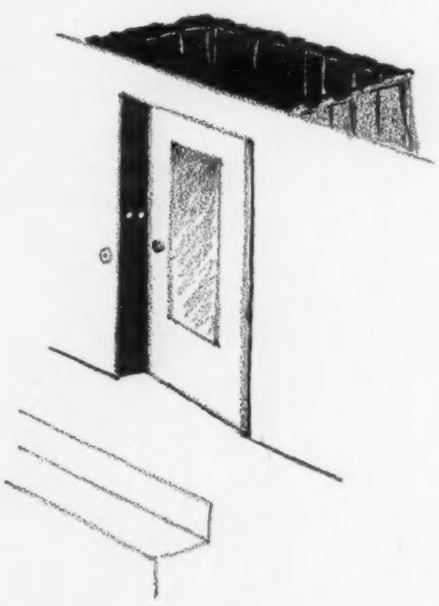
Most of the blacking out preparation being made by the public so far is being done pretty poorly, and certainly with no appreciation of how gloomy their homes are going to look with the black drapes or permanently black painted windows. Just because the name for it is **blackout** does not mean that everything **inside** the home must be black. All that is required is that the outdoors be black, that no light shows.

This creates an opportunity for the dealer in lamps and lighting equipment. He can represent a different point of view, a different approach to the subject, and save his business from going completely blackout itself unnecessarily. There is a definite public service to be performed.

In Britain, the British Library of Information tells us, **internal illumination is maintained during air raids.** Important work must not be interrupted and many people prefer to carry on with their nomal occupations unless bombs are actually falling in the near vicinity. Darkness inside homes would be extremely bad for morale. It is especially bad for women and children left alone, either with their men away in the armed forces or at defense jobs.

To dealers in the Mountain and interior sections of the West this may still be a remote necessity, although there is no telling, with an enemy such as this, when the War Department may decide to require blackout as a precaution in any part of the country.

These selling appeals are genuine reasons why people should **continue to buy** and to **use** light conditioning equipment in their homes: (1) Conserves the eyesight of adults, protects that of children. (2) Saves nervous energy and prevents tiring the eyes, and through them, the body. (3) Creates a more cheerful, restful environment, dispelling fear. (4) Permits important war work to be carried on uninterrupted, accurately, quickly. (5) Prevents home acccidents, promotes safety, permits preparation for emergencies, fires, etc. (6) Stimulates home activities, study, handcraft.



Illustrated at right, a simple light trap for home doorways. Edges of steps should be painted white and porch light kept off

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January 1942

How to be Happy though Blacked Out

or advice you can give your Light Conditioning customers

First decide what rooms you need to live in comfortably for two or three hours should a blackout alarm be sounded. Here in America the night-long raids suffered by London need not be expected or prepared for. But there may be many alarms at least of two or more hours duration. Might as well be happy during such "time out."

Select a living room, play room, breakfast room, or bedroom as a general assembly room. Consider how members of the family can reach the bathroom and kitchen from them without allowing light leakage. If hallways or passageways are to be used during blackout, take measures to black them out too or screen necessary lights to prevent leakage.

Think of the peace of mind and comfort of the family. In the blacked out assembly room provide **good lighting.** Have books, magazines, games, sewing, other means of entertainment and diversion available. Arrange activities away from windows in case of a blast.

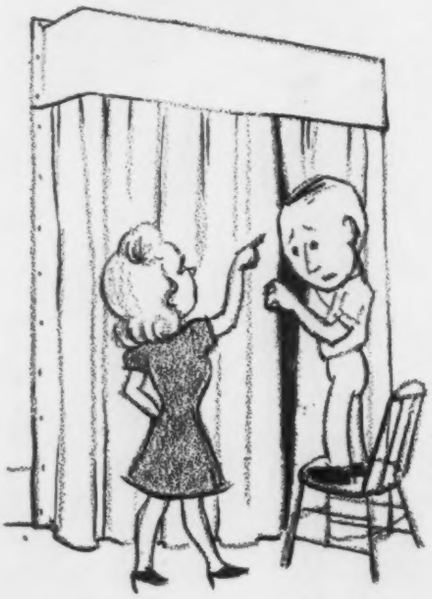
"Every effort should be made," says an official bulletin, "to so black out windows as to allow sufficient light in the room for reading and general eye comfort."

Three ways are available for blacking out the windows of a room.

1. **Drapes and window shades.**
2. **Removable opaque screens.**
3. **Paint or paper on the glass.**

Each has its merits and disadvantages. Select the method that suits best.

Draperies and window shades in combination are best because they permit drawing aside to admit daylight. If windows have venetian blinds heavier drapes will be required to offset the light leakage possible through the slats.



Shades already hung may be painted on the window side with a heavy coat of quick-drying paint to make them more light tight. Better yet are wider shades of heavy craft or treated paper, affixed closely to the inner window frame and wide enough to overlap the frame 4 to 6 in.

Drapes need not be drab. Regular chintz or decorative cloth window drape material can be lined with heavy, closely woven material. To prevent light escaping around sides, top or bottom, a generous overlap of cloth is needed. A six-inch overlap, preferably with snaps to make sure brushing against the shades will not permit light leakage, is recommended for curtains that meet at the center.

Curtains should be tacked to the sides of the window frame or fastened to a wooden batten.

A box valance at the top is best if its top is covered too to prevent light leakage. Where no box valance is used a valance of the curtain material should be hung over the top of the drapes to overhang the curtain top by at least 6 inches. This valance too should be tacked to the window frame or a batten.

Drape should extend below the window sill by at least 18 inches at the bottom. If hung on wire or curtain rod the drapes can be on small rings to permit sliding to the side for daytime lighting.

Recommended materials include:

1. Black or oxford gray cotton flannel, double nap or used in full drape or whatever thickness necessary to insure complete blackout.

2. Sateen of 64 x 88 threads or better, double thickness or gathered full.

3. Black heavy twills, denims, jean cloth or duck cloth, if used as tight drapes.

4. Percale, only if used in three thicknesses.

5. Fabricoid, imitation leather cloths and composition treated cloths, only as permanent tight drapes and provided they are heavy and resilient enough to insure against porousness.

5. Velours or velvet only if well lined.

If materials have already been purchased which do not come under these requirements it is recommended that arrangements be made to double or triple them or whatever is necessary to make certain no light escapes under blackout conditions.

Not recommended are oilcloth, which cracks easily when folded and develops

pinholes, paper cambric, or sheer fabrics of any kind. Such materials force the occupants to darken the room to avoid light seeping through and might as well not be used at all.

Floor and table lamps kept away from the windows, unless the side toward the drapes is masked to prevent direct light spilling on the curtains, will make it easier to secure perfect blackout.

Screens or shutters, if properly attached to the windows, are sometimes to be preferred. Such frames should be light in weight, easily put up and taken down, kept near the window at all times and away from radiators or heaters which might cause them to warp.

Fastening should be such as to give in case of a nearby explosion, yet not be hurled across the room. Hooks above the window frame and on the shutter and an elastic band, such as wide rubber band, or pieces of old inner tube, or leather strap to connect them, are recommended by Civilian Defense pamphlets.

Screens should fit tightly into the window opening and if necessary have a strip of felt or cloth pasted to the edges to prevent light leakage. A ball catch or some sort of fastening that will yield may be used near the bottom and sides. This suspension will permit the screen to swing upward in case of bomb concussion and return to its place.

Materials for screens may be varied from heavy opaque paper, black sheathing or strong building papers, thick cardboard, chipboard, wallboard or plywood. Plywood should be painted. Three-ply may warp. Lightweight materials for screens will require a frame that is strengthened by cross members.

Lighting will be better if the inner surface of screens is covered with white paper to increase its reflection inside the room.

Tar or roofing papers are not recommended for home interior use. Tar may run if subjected to heat and damage wood, curtains, etc.

Paint and paper are least desirable though easiest to apply. They will do temporarily until other methods are completed or can be used in bathrooms, toilets, staircases, hallways, storerooms where they can remain on permanently with least depressing effect.

To lessen this depressing effect the inside should be painted a light color to reflect as much light as possible and get rid of the "tunnel" effect.

Paint, the OCD recommends, when used, should be a heavy weatherproof asphaltic paint and applied to the **outside** of the window to reduce its reflection from outside. Paint should be used which is of a type recommended by the manufacturer for use on glass, or it may cause the glass to break. Painted windows should be examined carefully to see that no pinholes permit light to leak. It should be remembered too that paint gives no protection against glass shattering and splinters of glass may be thrown about dangerously by the concussion of a bomb even a block away.

Paper gives more glass protection against splintering. It should be heavy paper, preferably of fibrous, tough quality, and pasted to the window with a glue that remains tacky even after exposure to the sun. Sufficient overlap should be allowed at the edges to paste well up on the frame. Paper should be examined regularly to see that cracks or pinholes have not developed.

Doorways too should be protected by means of heavy drapes, preferably in the form of a light lock, and illumination near them reduced to the limit.

Blue light is not recommended. To the dark adapted eye blue light can be seen better than any other. Let no customer kid herself that blue light is safe. The only safe light is the well-screened light inside the house.

PUGET SOUND POWER & LIGHT CO.
PORTLAND GENERAL ELECTRIC CO.; CALIFORNIA OREGON POWER CO.; UTAH POWER & LIGHT CO.; IDAHO POWER CO.
ROCKY MOUNTAIN ELECTRICAL LEAGUE

The Law of Least Inconvenience

First of a series of good sense articles on business management

by Ken Hampton

MAN at best is a lazy being. Most of the things he does are for necessity and he likes to be inconvenienced as little as possible.

Merchants and salesmen should recognize this and use this quality in people to help their businesses grow. **The merchant succeeds best who inconveniences his customers least.** Let's state it as **a law of the least inconvenience** in merchandising. It is the principle that always works. The least a person is inconvenienced, the better he is pleased. It is no accident that 5c articles wrapped and ready for delivery sell easily. They answer two basic requirements:

1. The customer is not spending an unusual amount. He is spending a unit of money which he regards as of little consequence and which is readily available to him.
2. As a customer, he is inconvenienced least when he can point or reach for an article instead of asking for it. And he can secure immediate possession of it.

This product principle goes through all merchandising transactions. Installment sales built up the durable goods industries into their enormous peaks because it was less inconvenient for customers to pay small monthly amounts than it was to pay large cash payments.

Variety of stock is displayed with the idea that goods can be handled and delivered immediately to customers at small unit prices, again taking full advantage of the least inconvenience to the customer.

Electric appliances, notably the electric refrigerator, gained their great popularity when they met this same law:

1. Being paid for on convenient monthly terms and
2. Being delivered immediately from stock, plugged into the electric circuit and immediately going into customer use.

It is well to realize that electric appliances have been accepted by the public in almost direct proportion to the ease with which they can be:

1. Easily operated.
2. Easily installed.

This principle works in reverse for the merchant. The merchant's own greatest convenience of course comes from making for him and his salesmen as large an income as possible with the least possible inconvenience to himself. He does this easiest when he makes things most convenient, or least inconvenient, shall we say, for his customers. So as a merchant and a salesman, his problem becomes easier when he gives quick, efficient customer-pleasing service.

Merchandising is man's greatest expression of self-confidence. It stands as a tribute to his ability to reach beyond his immediate surroundings profitably.

I have always challenged the belief that trade started through necessity. It seems to me that trade came about because men wanted more goods than their immediate surroundings offered them. Generally these additional goods they wanted were luxuries designed to please their pride or adorn their families.

Witness if you will the tremendous fight over trade routes to the east which led to Columbus discovering America, a fight primarily for condiments, spices and perfumes that the East offered and which, after all, didn't make the European any better looking, although it may have made him smell better.

Merchandising is the modern expression of this trading. It is the merchant's expression of his belief in his **ability to buy goods which will so please the people in his community that they will pay him amply for his time and expense** in buying these goods and offering them for sale.

Today we have tremendous emphasis placed upon salesmanship. True, it is probably the greatest single factor affecting our lives. Because of it, our merchant can stay in his store and buy better than he could when as a merchant prince he had his own ships sailing the seven seas. The fact that he can sit in his store and do such buying makes it doubly necessary that he shall **buy soundly for the needs of his community,** because just down the street is a competitor who also sits in his store and buys.

The fight today is not so much in the merchant's ability to go to the market where the goods are offered as it is for him to please the producer well enough so he will come to the merchant's store first with his best offerings. Then when he has bought, his test of showmanship comes.

Home Service Keyed to Emergency

Puget Sound Co. advisors present nutrition help and lighting counsel to many women's groups

Home service will find a new and more vital place during the war. This has been demonstrated in utility experience in England since the war began. Companies whose home service departments have already laid a groundwork for such special customer service are prepared for this new responsibility. Excellent exmaple of this is the Puget Sound Power & Light Co. whose home service women, under direction of Mrs. Edith Rauch, will have contacted more than 40,000 women in over 800 meetings of from 10 to 1000 women during 1941, according to Pat Johnson, general sales manager.

The subject upon which special stress was placed by the women advisors have been lighting, from the standpoint of eyesight conservation as well as cheerful appearance of the home; cooking and nutrition. In the latter, emphasis was placed on how to preserve food, proper cooking to insure appetizing results and save food, selection of foods for better health combinations and economy, nutrition for defense, correct use of equipment to conserve essential nutritive qualities.

Participation in major cooking schools plus dealer store demonstrations and cooking schools in dealers' stores were part of this program. There were 335 dealer store demonstrations in a 9 month period. Emphasis was also placed on getting the public really to use the appliance they own.

The major program during the last three months of the year was that on light conditioning. Beside participation in the dealer training clinics conducted by the sales department, the 11 girls of the home service department were especially busy giving lighting talks to womens' groups of from 10 to 100. In these use was made of slides in natural color to demonstrate by examples harmonious decoration and lighting of the home. Selling no equipment, all inquiries were turned over to dealers.

An annual training school for the girls is held each January during which they refreshen their knowledge and bring themselves up to date on new methods. The aim is to keep them experts on nutrition so that they may pass on to homemakers, whom they contact in small group meetings, better cooking practices and eating habits to strengthen the nation against the strains of war.

There has been no discrimination as to national or racial groups in this public service. Recently cooking schools were held for the negro customers of the company in Seattle with great success. Under the auspices of the Japanese-American Courier, the one newspaper to Japanese-Americans printed entirely in English, two cooking schools a year are held to teach audiences of from 900 to 1000 American born Japanese women American ways of preparing and cooking food, an endeavor which is changing their food habits.

One of the projects upon which the girls' activity has been judged for the year has been the initiation of a light conditioned new home in cooperation with a local builder. The home was opened to the public for several days, publicity given it in the press, the girl explained the light conditioning attributes to its visitors. In this manner a standard was being set for home lighting which it was felt other builders would imitate.

Lighting clinics conducted by Puget Sound grew from a total attendance of 192 salespeople for the first, to 217 the second and 269 the third; 236 dealers attended the opening gun meetings. There were 31 light conditioning dealers at the start, 93 on Dec. 1. Below, the Bellingham meeting, addressed by Emory Branch, sales manager, C. T. Bakeman, Mrs. Rauch, A. E. Loft, and Charles Hess of headquarters.

Utah Women Also

Utah dealers heard of the possibilities for the sale of home lighting equipment in a series of meetings on home lighting problems conducted by Nancy Finch, assistant manager of residential sales, Utah Power & Light Co. Miss Finch demonstrated the proper application of lighting, both fluorescent and incandescent, to home decoration and for seeing purposes. To the dealers she offered the assistance of the company's dealer sales promotion women to conduct public demonstrations of a similar kind in their own stores. Their services are also available, she told them, to explain the relationship of lamps to the grouping of furniture as well as for better seeing conditions.

These sales promotion women also make available to organized clubs, and societies and women's groups demonstrations in lighting, range and refrigerator operation, small appliance use, kitchen planning, adequate wiring and meal planning. Even small groups called together in the home of a customer are given such demonstrations.

West Coast Lamps

West Coast Power Co., Portland, Ore., with scattered operating properties in Oregon, Idaho, California, Wyoming and Utah, recently completed a highly successful campaign for the sale of lamp bulbs. Quota set for the 5-week period of the campaign was 1424 kw. in sales of lamps from 60 to 300 watts inclusive. Twenty-seven thousand such lamps were sold by the company organization, totalling 2469 kw., or 173.3 per cent of quota. This amounted to 91.1 watts per bulb and added 173 watts per residential customer.

During the same period, 51 dealers in the company territory sold a total wattage of 157 kw., raising the watts per residential customer added to 202. In addition to the lamps counting toward quota in the campaign, about 250 kw. of smaller sized bulbs were sold by the company organization.

The campaign was designed and con-

ducted by C. A. Comstock, commercial manager. Largest unit sale was recorded by Dallas Dodge of Alturas, Calif., with 2849 bulbs, or a total of 229 kw. Ralph Williams of the Toledo district, Ore., sold the highest wattage of any individual, 238 kw., which was an average of 119 watts per bulb. Highest wattage per bulb recorded in the campaign was by Marshall Murray of Waldport, Ore., with 178.7.

Oakland Educates

Well attended by retail sales people from East Bay stores, the home lighting course conducted by the Electric Appliance Society, East Bay unit at Oakland, finished a series of four classes on Nov. 24. The course consisted of four 1½-hr. periods beginning at 8 p.m. Monday evening at the P. G. and E. auditorium in Oakland. Subjects covered the first meeting were "Purpose of the Course" by Ed Butler, chairman of the home lighting committee of the Society; "Light Sources" and "The Science of Seeing," Walter Carlson, Lamp Dept., G-E Co., and "Requisites of Good Home Lighting," H. H. Robison, lighting engineer, P. G. and E. The second meeting was addressed by Kenneth Grant, Incandescent Supply Co., whose subject was "Good Home Lighting Equipment." Nancy Jane Cox, home lighting adviser, Hale Bros., San Francisco and a former home lighting adviser of Northwestern Electric Co. of Portland, spoke on "Lighting Decoration and Color" and "Good Home Lighting Practices," answering a number of questions asked by members of the class at the first lesson.

Third meeting was addressed by John S. C. Ross, salesmanship instructor of U. C. Extension Division. Last meeting was closed with a sound slide demonstration "Seeing is Believing" and an answer forum conducted by a group of experts, and an inspirational talk "Your Opportunity" by L. Galbraith, division sales manager, P. G. and E. Walter Lind, supervisor of sales promotion, P. G. and E., was class leader and conducted the series.

● APPLIANCE DEALERS in Reno, Nev., in an effort to assure the buying public in their area that appliance shortages were not acute, took a cooperative full page in a Reno newspaper with the headline "Reno delivers the Goods." Theme of the copy was to the effect that electrical appliance stocks are not depleted. A survey of electrical appliance stores in Reno was made and the results, which indicated that no shortages existed, were released in the advertisement. Also discussed was the misconception regarding purchase conditions. According to the advertisement, the Reno dealers advised they are still in a position to offer major appliances at a reasonable down payment and monthly payment. The advertisement closed with the statement by the dealers that they are anxious to cooperate with the national defense program, and at the same time assist customers in every way possible to obtain necessary home appliances.

In addition to their full-page cooperative advertisement, the Reno dealers have been consistently taking space in special issues of Nevada papers, all advertisements promoting the idea that the appliance situation is in good shape in their area.

● THE NINTH ANNUAL ELECTRICAL SHOW sponsored by the Bureau of Radio & Electrical Appliances of San Diego County, broke all records with an approximate attendance of 125,000 people, visiting exhibits from morning to night on the six days of the exposition. Counteracting fears which have arisen in regard to major appliances, attendants at the exhibits discussed the probable availability of merchandise together with present financing arrangements. Numerous non-commercial attractions drew attention to the merchandising displays and stimulated general attendance. According to Bureau reports, the decorative scheme and lighting effects were adjudged the best of any of these annual shows.

Nancy Jane Cox, Hale Bros. home lighting advisor, formerly of Northwestern Electric Co., Portland, explains the why's of the IES lamp and home decoration

Market, Campaigns

● "TODAY'S JOB" in national defense and business preparedness will be the basic theme of the 53rd Western Home Furnishing Market to be held at the Western Merchandise Mart, San Francisco, January 26 to 31. Serious conferences with their preferred sources of supply are anticipated to be the prime motive of attending dealers and buyers. Coupled with a preview of 1942 styles and designs, problems of supply and merchandising will be discussed, looking towards an equitable arrangement from the standpoint of both the manufacturer and the dealer. Features of the Market Week will include the Industry Dinner, 15th Annual Western Radio & Appliance Trade dinner and the special buyers' night. Though the social activities will be limited, attendees will undoubtedly find all the "lighter side" desired afforded by San Francisco's famous night life.

Modernization and replacement of old model electric ranges, with a program to reach a peak in the late spring is being developed by the Los Angeles Bureau of Power & Light. The general field of range and water heater promotion will be covered with an expected increase in group demonstrations and promotion.

Bureau of Radio and Electrical Appliances of San Diego County, promotional plans held temporarily in abeyance until problems of war emergency have been given careful study.

California Electric Power Co., January, washer and ironer campaign, which will extend into February. No other special events

Pacific Gas & Electric Co., domestic lighting equipment and portable electric heaters were featured in the company's promotion for December, as good potential Christmas gift items of practical and enduring utility value. Newspaper advertisements carried out the comfort and utility theme in drawings and short copy.

California Retail Hardware Assn., announcement made that the Assn.'s annual convention will be held Feb. 17-19 in the Auditorium of the Western Merchandise Mart, San Francisco. Government officials and nationally prominent leaders of the hardware trade will discuss problems pertinent to the hardware industry. San Francisco Pot & Kettle Club will sponsor a luncheon for the visiting dealers.

PCEA Panorama — Edited by Mary Shoop

Electriquiz

Find out your E.Q. (Electri-Quotient) by marking these statements true or false. The answers are on page 72.

1. Three electric refrigerators can be operated today on the electricity required for one 15 years ago.
2. Southern California leads the nation in scientific school lighting.
3. A hot line means something different to a lineman and a co-ed.
4. A steam-electric generating plant recently built near South Bend, Ind., uses steam at the highest pressure in this country's history.
5. The British government terms "luxury" goods such American "necessities" as toothpaste, neckties, fountain pens and electrical appliances.
6. In the past five years over 50 new products have been offered in mazda lamps.
7. Neon lighting grew from nothing at the time of its introduction in 1938 to over a $100,000,000 business in 1941.
8. Only about 4% of the wired homes in the United States have electric water heaters.

Consumer Interest

Accomplishments of the PCEA district meetings in the promotion of public good will through understanding of the industry is shown in the following letter written by B. W. Shaper, principal of the Chico High School, to J. M. Fagg, Chico manager of PG & E:

"I want to commend you and the others on what seemed a very striking note in all the talks. . . . I refer to the consistent attitude that all of the men seemed to be primarily interested in the welfare of the consumer. His health, comfort and ability to afford conveniences seemed to be your primary interest and purpose.

"Being a lay person not of your group, I want you to know how inspiring and reassuring it was to go away from the meeting with the feeling of reassurance that the recognition of that attitude gave me. . . . I am confident that continuance of that kind of spirit will give you the kind of permanent foundation for additional outstanding successes."

San Francisco is the city.

The Fairmont Hotel is the place.

May 20, 21 and 22 are the tentative dates.

That is the news on the 1942 PCEA annual convention. Definite dates will be announced after investigation of possible conflicts with other industry meetings scheduled for the latter part of May.

The Year Ahead

School committee appointed, other projects started

RANGING from school lighting to transformer hangers, many matters of importance were acted upon at the recent meeting of the PCEA board of directors, held in San Francisco. A number of the recommendations came from the November conclave.

Inclusion of modern lighting standards in school building requirements will be the goal of a new committee to be appointed by President George C. Tenney. State agencies will be contacted by the committee, whose organization was recommended by the business development section following a suggestion from Charles D. Gibson, chairman of the school lighting committee of the California Association of Public School Business Officials, and superintendent of the Mountain View School District, El Monte, Calif.

To the distribution line investment costs committee was referred the matter of solving the difficulty resulting from conflicts between the recently adopted NEMA standards for transformer hangers and the requirements of the California Railroad Commission.

Association directors authorized a letter from PCEA to each utility company member requesting executive endorsement of the Uniform Electrical Code and suggesting that local managers promote its adoption.

Investigation of the need for a revised edition of the air heating hand book and approval of the 1942 PCEA budget were other matters of interest, as were the reports of the enthusiastic activity of the membership committee and the industry information committee. The latter has started plans already for the 1942 fall series of PCEA district meetings.

Who Am I?

I was born on a farm near Campbell Hill, Ill., on Oct. 4, 1884. After attending high school in Murphysboro, I entered Central Normal College, where I graduated in 1906 with the degrees of L.L.B. and B.Sc. From 1906 to 1916 I practiced law in Idaho, Alaska and Washington, and was a member of the Washington legislature in the 1913 session. Who am I?

I was assistant attorney-general of Washington from 1916 to 1919, and was a member of the Public Service Commission for the next five years. In 1924 I resigned to enter private practice specializing in public utility law, and during the next 14 years represented various utility and transportation companies in regulatory proceedings before commissions and courts. Who am I?

In 1938 I was elected president of the California Oregon Power Co. In August 1941 I was elected president of the San Diego Gas and Electric Co. I belong to various San Diego clubs and organizations and am a director of the Chamber of Commerce and the Boy Scouts. I am a Mason, a Presbyterian and a Republican. I have one wife, three children and one grandchild and my name is: See page

RMEL Carries On

Post-war power and electrical merchandising conditions are the objectives at which the Rocky Mountain Electrical League is aiming with its 1942 promotional program. Instead of retrenching as a concession to threatened shortages on electrical equipment and household appliances, due to priorities pressure, RMEL has anonunced that New Year plans involve even more vigorous measures than were employed in 1941.

At a special meeting Dec. 11, League members ratified the bold strategy worked out by President-elect J. W. Alexander, and Gaylord B. Buck, whose term of office expired Jan. 1, 1942. These two men, cooperating with key executives of the organization, com-

pletely scrapped a cautious, short-range program which had been prepared for their consideration. In its place they recommended a twelve-month selling crusade which will keep the public fully conscious of electrical services and retain the market against the time one, five or ten years hence when defense industries will be released for production of civilian requirements.

Threatened shortages of advertised electrical goods, President Alexander argued, are temporary. Electric power plants, distribution systems, factories manufacturing electrical products, and their distributing agencies, are permanent. A collapse or weakening of sales tactics will mean surrender of markets which must eventually be re-won if outlets are to be provided for huge energy surplusses during the reconstruction era.

RMEL committees are preparing details of the ambitious agenda which will call for an increased budget and greater activity in all promotional lines.

Success of pre-Christmas electrical expositions under RMEL guidance in Colorado, Wyoming and New Mexico was partially responsible for the League's decision to adopt the long-range policy:

Sterling, Colo., RMEL'S "baby" unit, staged its first "Buy Something Electrical for Christmas" show, employing the famous "Black Light" and dancing girls which, for two successive years, have drawn record crowds to the Denver League's expositions. Several times the population of Sterling was attracted from the surrounding rural area to be entertained—and to see prevues of 1942 electrical appliances.

Pueblo and Denver, Colo., offered a "Merchandise Review," in which utilities, dealers, distributors and contractors joined, with special sections in local newspapers, and radio programs to step up public interest. Window displays were unusual and elaborate. Salesmanship methods included a guarantee of quick delivery on electrical appliances which had been reported scarce.

Casper, Wyo., featured a historical display of cooking and lighting equipment since caveman days. Two entire floors of the Mountain States Power Company's building were devoted to this event.

These, and similar expositions in Albuquerque and Santa Fe, New Mexico, and in various parts of Wyoming, other than Casper, occurred between Thanksgiving Day (Nov. 21) and Dec. 5, heralding the opening of the Christmas shopping season and making their bid for electricity's part of the Yule dollar.

Two IES Conferences

Two regional conferences of the Illuminating Engineering Society in the West are being contemplated for next year. While definite dates or plans have not yet been announced, both Seattle and Los Angeles are considering holding a regional conference, possibly a week apart, at which a number of prominent speakers from the East would be scheduled for both meetings. Arrangements and details are in the hands of local committees. Frank A. Hansen, who was persuaded to retain the vice presidency for region H, also reports the possible changing of the boundaries of Region H. The state of Wyoming would be served by the newly-created Rocky Mountain chapter at Denver and British Columbia may become part of Region H. New chapters are being considered for Salt Lake City, Vancouver, B. C. and Honolulu. Suggestions have also come that "lighting clubs" be established in Idaho and Montana until such time as chapters could be effectively organized.

Elections, Meetings

C. A. Comstock, West Coast Power Co., was elected president of the Portland Electric Club on Dec. 18 for the coming year. He succeeds Norman Hayes of Stubbs Electric Co. who held the position during 1941. Mr. Comstock has been commercial manager for his company for a number of years and has been active in the affairs of the Electric Club since the club's early history.

Other officers elected at the Dec. 18 meeting were first vice-president, George R. Shultz, Garland-Affolter Engineering Corp; second vice-president, Harold P. Kelley, H. A. West Co.,; secretary, George H. Card, Montgomery Electric Co.; treasurer, J. M. McKay, Portland General Electric Co.; sergeant-at-arms, R. G. Harris, Maydwell & Hartzell; and directors, Clause R. Groth and J. Bruce Kilmore, both of Pacific Power & Light Co.

New officers of the Electric Club of San Francisco, Associated Membership, are president, Lee Collins, Westinghouse Electric Supply Co.; vice president, Charles Farrow, Pacific Electric & Mechanical Co.; secretary, Wallace B. Barns, Electrical Agency; treasurer, Chart Maltby, Grey Electric Supply Co.; directors, Charles Knapp, Joselyn Co. of California and Ed Thegard, Westinghouse Electric & Supply Co. Other directors previously elected for a two-year period are E. C. Adams, Smoot-Holman Co., and Fay Lemoge.

* * *

New officers were elected at the Dec. 4th meeting of the Electrical Estimators Club, Los Angeles.

* * *

San Francisco Bay Cities Section, I.E.S., heard F. L. Mason, department of Optometry, University of Calif., discuss and demonstrate "Light and Vision" with particular attention to brightness, contrast and glare, at the Dec. 10 meeting. In view of the importance of this subject to lighting installations, the organization was most appreciative of Mason's talk.

Electric Club of Washington, Seattle, Dec. 1, a presentation of "Fluoralulu—and the Seven Whites", the hilarious and unique presentation of fluorescent lighting originated by Bill Cyr of Electrical West. Vancouver Section, AIEE, Dec. 1st, "Hydro-electric Development in B.C." was the topic discussed by E. Davis, comptroller of Water Rights, Dept. of Lands, Victoria, B.C.

* * *

Southern Calif. Chapter, IAEI, Nov. 19, a general discussion of inspectors' problems featured this meeting and further discussion on this subject will be extended at the January 28 meeting at Compton, Calif.

* * *

Electric Club of Los Angeles, Dec. 1, a clear and concise picture of the industry's problems and future was presented by W. E. Mullendore, executive vice pres. Southern Calif. Edison Co. Mullendore analyzed "free exchange"; the effects of half-completed exchanges and a description of what constitutes "fire works" which brought things economic down to a "2 and 2 make 4" basis.

* * *

Southwestern Section, IAEI, called off their Dec. 10 meeting, scheduled to be held at the city hall in San Francisco, due to blackout restrictions on that official building.

* * *

Oakland Electric Club, Dec. 15, saw a film, "Coaxial" presented by Geo. A. Springer, commercial representative, Pacific Tel. and Tel., which was a record of a history-making event in communications—the first commercial installation of coaxial cable. The club also held its annual Christmas party on Dec. 22, which was voted an outstanding success by all attending.

* * *

Utah Chapter, IAEI, Nov. 18, heard a discussion of "Motors & Controllers" by John Fisher, electrical inspector of Provo, Utah, who discussed Code section No. 4030 beginning with that subject. Following the presentation by Fisher, an open forum was held on the subject. At the Dec. 2 meeting of the organization, the annual election of officers was held and J. Hyde Stayner, Utah Power & Light Co., was elected chairman; Reuben E. Baxter, asst. electrical inspector, Salt Lake City, vice chairman; secretary and treasurer, Elias J. Strong, Electrical League of Utah. Stayner, nominated by John Christensen, was presented to the gathering as one of the most faithful and active members of the chapter since its organization, and his election to the office of chairman was carried by acclamation. Following the election, the meeting turned to a presentation of "Electrical Accidents" by M. E. Dansie, and a discussion of the hazards causing such accidents. On Dec. 16, the General Electric Supply Corp. played host to the organization at a program featuring the showing of a defense industry film, and a discussion of residential building problems by Elias Strong, member of the State Defense Housing Board.

* * *

Certified Electricians, Pomona, at weekly meetings held Dec. 5, 8 and 15, discussed the general aspects of their industry, and considered individual problems of members.

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Washington State Chapter, IES, Nov. 24, featured a paper on "Aviation Lighting" which reviewed modern practice in the U.S. and Europe, by C. B. Worthley, lighting engineer for the Civil Aeronautics Authority.

* * *

Oregon Chapter, IES, Nov. 24, heard Walter Potter, General Electric Co. speaker, on "Color Temperature." And at the Dec. 29 meeting the subject "Blackout and Anti-Sabotage Lighting" was discussed by T. W. Fitch, PGE-illuminating engineer and chairman of the Oregon organization.

Teaching Children, Not Subject Matter

Today's educational methods are different; they require better seeing and environment, factors that better lighting can give

*By Charles D. Gibson**
Superintendent, Mountain View School District, El Monte, Calif.

IN their talk for better lighting to school people, many representatives of the electrical industries place major emphasis on the dollars and cents angle that better academic achievement will result for students and thus educational costs can be lessened. There is no scientific proof back of this contention and therefore a profession like engineering that bases its existence on factual data and defensible formulas cannot afford to use it. All that the many studies carried on in so-called "controlled" classroom situations over the nation prove is that they prove nothing.

If those who are really concerned about adequate classroom lighting wish to get some clues as to good methods of procedure they might well turn to industry for guidance. When one of you gentlemen is confronted with a problem of installing an adequate lighting set-up for a plant that is turning out some machine-made product, you make a very thorough survey of the situation. Probably you begin with the product itself and determine by its nature the kind of workmanship required to make it acceptable to the buying public.

Does the manufacturing process require minute and detailed work; how much of the success of the product is controlled by the human element, in your case particularly, by how well and how easily the worker can see his work? What is the location of the machine in relation to present light sources? What are the conditioning factors of the general plant environment, such as overhead and underfoot conditions, paint or lack of it, and so on? You make a detailed memorandum of the important and particular conditions which surround and control what you believe to be the best possible solution to this specific illuminating problem. You gather the facts and create a course of action in the light of what you find.

If our engineers applied the same techniques of study to school lighting that they do to industrial lay-outs, what would they have to know? They would find it necessary to have up-to-date information as to what goes on in the classrooms they are going to light.

Most engineers make the mistake of thinking of the present day school in the same way they visualize the little red schoolhouse they attended. They plan in the light of the activities that were carried on in school when they were kids and most of their efforts show it. The field of education has resisted progress for many, many years but even it, builded upon the uncompromising conventions of our Pilgrim forefathers has yielded grudgingly to the irresistible forces of change.

Some would have the public believe that conditions have changed so much that now instead of having the Little Red Schoolhouse, we have little "reds" in the schoolhouse. Such is not the case, I can assure you. The first line of defense for the democratic way of life still stretches through the schoolrooms of America and the sooner men like yourselves realize the significance of that truth, the sooner will you help create a more American and equal chance for the children in those schoolrooms by cooperating more closely with us in providing better working conditions for those children.

The change that has come about in the field of education has been one of emphasis. A visit to any classroom would show you that they are filled with a great many books, paper, pencils, blackboards, desks, maps, pictures, many good looking teachers and about seven foot-candles of light. The real emphasis in our schools has changed in only one respect. *We are now teaching children instead of subject matter.*

A very healthful and wholesome respect for the individual child is beginning to take the place of complete emphasis on drilling factual information into the heads of a class group. We are beginning to recognize the necessity of dealing with the individual differences of children. We are gradually becoming conscious educationally of a fact that has been apparent to all mankind

Different from the old schoolroom with its rigidly fixed rows of desks is the modern classroom, where groups of children work together around tables of height convenient to their size. The lighting need in a classroom of this kind is one of excellent illumination without shadows or glare in every part of the room whichever way faced

* From a paper, "Lighting and Education," presented at the conclave of the Pacific Coast Electrical Assn., Fresno, Nov. 6, 1941.

A modern schoolroom should be an efficient workshop, every inch of it usable. Such a room, above, shown facing each way, illustrates this ideal. Lighting is automatically photo-electric cell controlled, lower portion of windows at eye level are louver-shielded, venetian blinds direct upper window light to the ceiling; no glare from any source.

since the dawn of time, namely, we are all different. We learn to walk, to talk, to read, to write, to assume responsibility, not all at the same time, but according to rate of growth and development which is peculiar to each one of us.

This change of emphasis has created four very obvious factors in the modern school which have great significance for the electrical industries.

1. The first large factor in the modern classroom that demands easy-to-see conditions is that children read at least three times as much today as did children of the same ages a few years ago. Our classrooms are filled with great numbers of books of all kinds and subjects on all levels of reading difficulty. The great numbers of well written, well illustrated textbooks available to all schools are supplemented by practically unlimited quantities of additional library and school owned reference books.

Instead of short periods of reading from a few uninteresting and poorly adapted readers, as was the case in your school life, the child of today finds reading activities of one kind or another taking up a large portion of his school time. Reading is recognized as one of the most critical seeing tasks the average person performs. Here then we find a legitimate reason why we need a minimum of 20 foot-candles of glareless light for classrooms.

2. The second factor to consider is that the old school broke up its day into 15, 20 or 30 minute periods. These periods were used for a lesson in some one subject, like spelling, arithmetic, writing, language, etc. These subject fields were unrelated one to the other. Today, we lump together subjects like geography, history, civics and some language arts into one subject head called social science.

The social science period, during which time all the before named subjects are studied in relation to one another, lasts for an hour or an hour and a half. Large subject areas and large blocks of time are used. This modern classroom factor calls for longer interest span on the part of the students. Fatigue caused by inadequate light is a major factor in shortening interest or attention span.

This problem of fatigue is of tremendous importance to all of us. It offers one of the finest arguments known for adequate illumination. Charles Sheard, Ph.D., of the Mayo Foundation, Rochester, Minnesota has made a most interesting and valuable statement on this subject.

"Even under adequate lighting and with normal vision, it has been estimated that there is a consumption of a quarter of the bodily energy in the processes of seeing. When vision is normal, the ease of seeing is controlled almost entirely by sufficient and proper lighting. However, when the illumination is improper or inadequate, and when the vision is poor, then the consumption of bodily energy is increased above the usual necessary amount. Poor vision causes uncertainty, tension, annoyance and distraction, and these in turn result in increased expenditure of energy, also contributing to such eye fatigue symptoms as eyestrain and headache.

"While difficult to analyze, we know that fatigue caused by visual tasks is but a part of the bodily fatigue which comes on as a result of the various kinds of activities in which we engage under the supervision and guidance of vision. Hence eye fatigue, just as body fatigue, is lessened when seeing conditions are favorable.

"So we may be assured that any factor which increases the ease with which we see will aid in decreasing the needless waste of energy from this cause.

"We have the results of the researches of scientific laboratories which show that the eye adjustment, which is needed in order to see fine details near by, is considerably compensated for by the use of adequate light. This means that adequate illumination partially substitutes for the focusing action of the eye, aiding us to see clearly with a minimum of focusing effort.

"Therefore, all scientific evidence which we have shows that the greatest ease and accuracy of vision are to be obtained when the eyes are functioning as normal, and when the illumination on the work in hand is adequate. Good lighting is not only a part of our environment which plays an important role in our mental and emotional life; it also directly decreases eye fatigue, muscular strain, and energy losses."

In the face of that research, who could reasonably question the positive relationship of adequate light to length of interest span?

3. The third factor of new importance is that of greater attention to the schoolroom environment. The general appearance of the old classroom was pretty dingy. Dark stained woodwork, oiled floors, three walls of blackboard, drab wall surfaces certainly didn't make for much aesthetic appreciation. Today stress is placed upon having as cheerful a room as possible. Lighter woodwork, light colored floors, a half or a third as much blackboard, nicely colored wall areas, all play a part in providing a more pleasant environment in which to work.

Proper natural and artificial light can enhance this environment further and in reality can make it an ideal work space for children. Adequate light is the final element necessary to distinguish between an ordinary environment and attractive surroundings.

4. The fourth and maybe the most important factor of all is the new emphasis on physical, emotional and mental health. The old school wasn't much concerned about the health of children. Everyone realized that good health was necessary for successful endeavor of any kind, but the school didn't take any responsibility for this phase of human happiness. Today this picture has changed.

All modern schools are deeply concerned about the health of children and are spending time and money in generous amounts to do something constructive about it. Medical doctors, nurses, dentists, posture experts, psychologists, and many other specialists are thumping chests, giving health talks, counting cavities, lifting arches and measuring mentality, in an effort to help children toward a healthful life. Since seeing is a task that requires much bodily energy and since eye health is so directly connected with general health, it would seem logical to expect educators to consider adequate illumination as a health *must*.

The four factors just discussed are obvious ones that can be appreciated by casual association with the classroom environment. There are other factors, much less obvious, which are well known to the experienced observer but which escape the lay person and, I'm afraid many educators are not fully aware of their significance. They might be classified as psychological factors. Only three of them can be brought to your attention today due to the limited time left for this presentation.

5. Someone has classified light as a "mood-conditioner." If we stop for a moment to recall the many experiences we have had which would verify light as a definite "mood-conditioner," we could all agree that we have ourselves, at one time or another, been "conditioned" by this means.

That time you walked by a modern cocktail lounge what kind of lighting did you observe? I am told that people who patronize such places do so to relax and what kind of lighting do we find? You notice next time.

The theatre long has conditioned the audience and the actors by lighting effects and the motion picture industry is symbolized by the cry—"Lights—camera—action." The whole entertainment world relies on light for its main prop and mood conditioning as related to the esthetic sense as its chief resource. Someday churches will learn to use light.

What kind of mood do we want children and teachers to be in while living in a classroom? Whatever mood you choose, you can get it by using light and color. What kind of aesthetic feeling do we wish to stimulate by our classroom environments? I suggest a feeling of space, of order, of cleanliness, of cheerfulness, of action, of work, of aliveness, of relaxation, of beauty, of pride, of belonging. All of these feelings can be stimulated by light and color. Naturally other elements are desirable to increase the degree of this stimplation. Color plays an important part, but color is dependent upon light, also.

Like boards of directors the children work together on educational projects. Related subjects are treated together and interest span must be maintained

6. No one can have a feeling of well-being if he is crowded. Space is an essential to normal growth and development. The feeling of space which leaves one with an aesthetic sense of good proportion, line and form can be gained to a large extent by good lighting. Of course, your furniture arrangement and pupil load are physical conditions which deny psychological manipulation.

All other things being equal, however, you will find a well lighted room actually is larger both psychologically and physically. It is larger physically because those dark corners and niches become usable work areas when well lighted. Usable floor-space stretches by the square foot when shadows and dark corners are dispelled.

7. With light comes order. There is something about a well-lighted room that demands careful arrangement. There are no dark corners to stand odds and ends in—spare maps, scraps of lumber, etc. Cleanliness and order go hand in hand and light fosters both.

The data on the relation of good lighting to noise are not established well enough to place it in the same category as the factors we have just discussed. However, there is evidence which indicates that a well lighted classroom helps in the orderly arrangement and administration of that classroom whether such order and administration is a product of the teacher or of the class group. Short interest span due to fatigue — restlessness — unnecessary motion—squirming, etc., has a definite relationship to lighting conditions.

Rainy-day schedules which shorten class periods and dismiss the children from school at an earlier hour than usual are not merely devices to allow children to reach the shelter of their own homes and thus achieve security from a storm. Rainy-day schedules are devices used by administrators to protect the capital investment of the school district. When the walls of your buildings begin to bulge with the tensions created within them because children cannot see well enough to carry on their regular activities; and when teachers begin to lose their customary sweetness of disposition and with it the control of their groups; then it is time to send the children and the teachers home if you wish to save the furniture and in some cases the building itself. The lack of proper lighting is one of the very large factors influencing this kind of behavior.

8. With the feelings that can be stimulated by space, order, cleanliness, cheerfulness, relaxation and beauty will be added a sense of pride and "belongingness." If one suc-

ceeds in arousing the comforting sensations which accompany these feelings, he has provided a child with an environment of which the child is proud and anxious to be a part. Maybe success of this nature through the use of light is light's greatest contribution to helping children have a truly constructive educative experience.

Perhaps the aliveness—the freedom to work easily all over the room—the cheerfulness reflected from the very walls—the space without shoving for it—the order, cleanliness and neatness which make messy desks and floors seem out of taste—maybe these factors create an awareness, readiness and interest that make for a new approach to the child's schoolroom life. Science cannot prove or disprove this possibility.

I earnestly suggest that your electrical associations establish a standing committee to work with other kindred groups toward some definite action on this problem. One thing this committee could do is to help set up legislative measures in the states you represent which would give authority to existing agencies to set minimum lighting requirements for schools. Another existing agency could be given the power to enforce such legislation.

In California we have a Division of Schoolhouse Planning. All plans and specifications for schoolhouse construction go to this Division of our state government for approval before any construction work can begin. The Division of Architecture checks all plans to see that they conform to the specifications of the Field Bill, etc. A state inspector keeps his eagle eye on construction along with the city or county inspectors on the job. Regulations set up by building departments, plumbing codes, electrical codes, etc., are enforced by these men.

We have laws and regulations which insist upon earthquake resisting construction—cubeage in relation to pupil load—window area to floor area—the number of toilets—the kinds of plumbing—drinking fountains—doors—fire regulations—sizes of conduit, service and wire—the location and size of school sites and we even have some specifications calling for shade trees.

Well over eighty per cent of everything one ever learns comes to him through his visual sense. Why then shouldn't any government be anxious to protect this priceless heritage of our children?

Recently, I saw a letter from a Canadian official which stated that in the province of Ontario, Canada, the amount of financial support granted to schools in that locality, was partially determined by the kind of *lighting* a school had! I saw pictures of typical old-fashioned one-roomed schools with oiled pine floors, a wood stove in the center and a platform for the teacher's desk that had six well-designed ceiling fixtures with special banks of auxiliary lights for the blackboard areas. There is nothing new about governmental regulations regarding lighting.

Of course, if this Association did sponsor any move toward setting and enforcing minimum lighting standards for schools, it would immediately be subjected to critical abuse for trying to force school districts to purchase the products you have for sale. You would expect that. Naturally there would be a greater volume of business to be passed around should minimum lighting standards be set for schools.

On the other hand, the electrical industries could well afford to show their good faith even more than they already have by cutting profits on sales to schools to the absolute minimum. In fact, some items could be furnished at cost or for just their advertising value because the business obtained from schools under this plan would be a mere pittance by comparison to the great sales volume that would be created by educating youth to the advantages and comforts of adequate lighting. This educated citizenry would carry over the desire for these new-found advantages and comforts to the practically untouched markets of out-of-school life in the homes, businesses and industries of our nation.

A complete dental clinic to protect the health of children in many schools. Eye health is also just as important

New Portland Code

Modifies wire tables; other interesting changes made

A new city electrical code, incorporating a few interesting changes from the National Electrical Code, has just been published by the City of Portland, Ore. Codified by the Bureau of Municipal Research of the University of Oregon, all sections carry a standard decimal system code number for the city as well as the section and paragraph number approximately according to the National Electrical Code. Administrative provisions are carried in Part I. In Part II are the minimum requirements for electrical wiring and equipment.

According to L. W. Going, chief electrical inspector, the principal changes are as follows:

Curent carrying capacity tables for wire are according to the 1937 Code for 500,000 circ. mil. and smaller wire "provided the root mean square value of the ampere load during any 3-hour period does not exceed 80% of the conductor rating." Likewise, an 80% factor is applied when 4 to 6 conductors are in a raceway, 70% from 7 to 9 conductors. The carrying capacity on 2-wire feeders is also increased 10%.

Experience with oil-burner blower motors has satisfied Portland that it can allow 9 amp. on basement circuits instead of the Code 6-amp. limit.

A table of lighting loads and demand factors is included in Section 2202. In it, not only the occupancy is listed but the watts per square foot, the wattage based on the area served, and the demand factor in percent for various occupancies. This table calls for more than the Code requires. Its purpose is to provide adequate feeder capacity even if the extra circuits are not installed.

Horsepower-rated switches are required for transformer type arc welding machines. A note gives the reason. "Serious injuries have resulted from opening control switches on welding machines when the electrodes are welded into position so as to maintain a short circuit on the secondaries of the machines." Such switches are required to be ampere rated and at twice the full load current.

Type S or non-tamperable fuses have been required in Portland for 15-amp. circuits for some time. The new Code carries this same provision. Extensive experience with range loads around Portland justifies the permission of a smaller-size range neutral than the N. E. Code. A 70% factor is applied. This usually reduces the neutral one size on an average residential installation. Fixed appliances in addition to a range and water heater, having an aggregate rated capacity of 3,000 watts or more, are permitted a demand factor of 70%. Standard voltages are specified in the computation of range loads.

There are two new sections on the "size of meter cutouts and switches" and "4-wire 3-phase systems." Likewise, examples are given for calculation of service and feeder sizes for single family, one-story store and multi-family dwellings.

Additional paragraphs are added to Article 374 on auxiliary gutters. Three

years of experience with the Portland requirements have proved the advantage of these extra rules. Bus bars are required where bigger than 4/0, even on the load side. Clearance of bare live parts is also required. Tap conductors from bus bars are not permitted to reenter the bus bar enclosures and must leave them opposite terminal connections.

Use of small-diameter wire in rewiring is expanded by elimination from the N. E. Code of the limitation "where impractical to replace raceway."

Trailer Danger

A dog was killed by coming in contact with the energized frame of a house-trailer at San Diego Trailer Site last August. This accident started an investigation which has now brought about the grounding to water pipes or driven grounds of the 3,000 house trailers purchased by the Farm Security Administration for use as "stop-gap housing" in overcrowded defense centers.

Following the accident to the dog, inspection was made by the San Francisco engineer from Region 9. Out of 350 trailers of one make alone, nine were found to have energized frames. Further inspection revealed that nails or screws used in attaching the metal moulding strips caused five short circuits to the frame.

Such trailers come equipped with a 45-ft., 2-wire extension cord with standard bi-polar plug at each end. In standard trailer equipment no provision had yet been made for grounding the frame. Two important safety measures had been overlooked; first, there was nothing to prevent the frame and metal mouldings on trailers from becoming energized; second, there was no provision to identify wires to the fixture sockets. Section 2541, 1940 National Electrical Code, calls for grounding of all exposed metal likely to become energized. Section 4140 likewise requires that fixture sockets be wired with identified ground wire.

Trailers are usually wired with No. 14 rubber-covered wire concealed between the outside walls and interior plywood finish. Wiring is held down with insulated staples. Although trailer manufacturers took care that no nails or screws were driven in the proximity of the wiring and government inspectors required that short nails and screws be used in such a manner that they could not even touch the wiring, only a 97.7% job was done. Since such trailer camps are over-run with infants and very small children, this was not good enough.

Cause of the energized frame and moulding in 1.43 percent of the cases tested was found to be long nails or wood screws driven into a wire. Other causes were pinching of the loose wires extending from the body to the door of

Children play around trailers too. Metal rest is not sufficient ground for safety

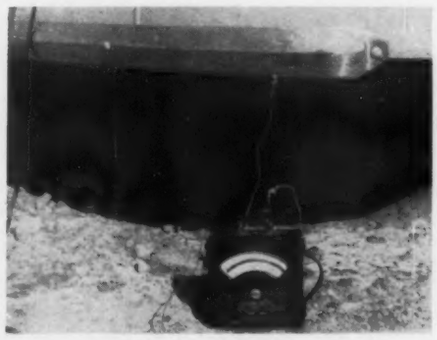
the luggage compartment, and careless installation of outlets.

To test for grounding, the associate electrical engineer from the San Francisco office of FSA used a 0 to 75 a-c milliameter with a 2500-ohm, 10-watt wire-wound resistor in series as a current limiting resistance. This was used instead of a voltmeter in order to determine current flow rather than potential. Connection was made between the instrument, the frame of the trailer and a water hydrant.

As a result, the FSA has now completed the grounding of all house trailers in use by it in California and Oregon, either to water piping systems or to approved driven grounds. No action was taken to require identification of circuit wiring to the sockets because all black wire had been used in the wiring.

One trailer manufacturer has viewed the situation with such seriousness that he is now wiring trailers with surface wood moulding after all other work on the trailer is complete. Some manufacturers had maintained that the metal posts used to rest the end of the trailer on the ground were sufficient grounding but tests proved otherwise.

Milliameter between trailer frame and water pipe has often revealed flow of current of considerable magnitude



Shortages Worry I A E I

Shortages of electrical materials worried the electrical inspectors attending the International Association of Electrical Inspectors, Southern California chapter meeting, at Torrance, Calif., recently. The meeting was presided over by Earl E. Malmgreen, chairman.

Morning discussion on inspectors' problems brought forth that of radio interference troubles caused by fluorescent lamp installations. Improper grounding facilities for fluorescent fixtures were also criticized. Welding outfits used in industrial plants also brought a number of problems. Frank Short, Industrial Accident Commission, recommended disregard of the nameplate ratings of the motor generators and finding out from the manufacturer what the continuous duty rating of the motor is and specifying circuit wiring and protection on this.

Availability of the type S or tamper-resisting fuses was discussed in view of the requirement in the Code for enforcement of its provision, beginning November 1st in respect to installation of these fuses. This was followed by the general topic of the availability of materials. The Industrial Accident Commission had advised its inspectors not to authorize any substitutions until conditions really warranted. Each installation would then be handled on its merits.

A resolution was passed asking the Pacific Coast Electrical Assn. to inform inspectors of any changes in the available stock of essential supplies. It was suggested that a series of meetings be held in Southern California for discussion of this problem. Opinion was general that no changes in ordinances should be made but each case of substitution be handled individually.

At the election of officers for 1942, Carl Herkelrath, city electrical inspector, San Bernardino, was named chairman and Herbert Ufer, Underwriters' Laboratories, reelected secreary-treasurer. Next meeting is to be held at Compton, Jan. 28.

● RECOMMENDED LEVELS of illumination for over 150 industries, with footcandle intensities broken down for typical plants, have just been made available in a concise form by National Better Light-Better Sight Bureau in the Bureau's "News." Walter Sturock, General Electric Co. Lamp Department, and O. P. Cleaver, Westinghouse Lamp Division, are credited with the compilation. The recommendations have been prepared to form an 8-page booklet when cut and folded, thus making them a ready reference on standard lighting practice.

EMEA *Dope Sheet* — *Edited by Howard C. Park*
EMEA of So. Calif.

Fuses for Overload Protection—I

Practical, useful information for the Maintenance Engineer in respect to a much used "safety valve"

The codes require overcurrent protection (with but few exceptions) for all ungrounded conductors and stipulate that the rating of such protective devices shall not exceed the normal current carrying capacity of the conductor.

Overload protection has been compared to an insurance policy. Such a comparison is only relatively true. An insurance policy *will not prevent* damage; it will only *repay* for damages incurred. While the proper selection and installation of overload protective devices *will prevent* damage from occurring, obviating the payment of damages.

Circuit breaking devices are used to limit the current flow in distribution circuits and electrical equipment.

Function of Circuit Breaking Devices

The function of circuit breaking devices is to provide an automatic means of interrupting an electric circuit when the current exceeds predetermined limits.

Insulation Protection

The purpose of limiting the current values in an electric circuit is to protect the insulation from the deteriorating effect of heat produced by overloads and short circuits.

Insulation is the weakest link in the proper operation of most—if not all—types of electrical equipment.

Heat Generated by Electric Current

Since conductors provide resistance to the flow of an electric current; heat is generated in proportion to the amount of resistance, the quantity of current and time of flow.

$$\text{Heat generated} = \frac{I^2 R t}{1055} \text{ b.t.u.}$$

or since, one watt = .000948 b.t.u. per second
heat generated = .000948 $I^2 R t$
When, I = amperage flow
R = resistance in ohms
t = time in seconds

A 15 amp. load on No. 14 R.C. wire will produce a 10 deg. C. rise in temperature.
A 17.5 amp. load on No. 14 R.C. wire will produce a 15 deg. C. rise in temperature.
A 22.5 amp. load on No. 14 R.C. wire will produce a 22.5 deg. C. rise in temperature.
A 30 amp load on No. 14 R.C. wire will produce a 40 deg. C. rise in temperature.

The current carrying capacity of conductors is based on the amount of heat that the insulation of the conductor can safely stand without deteriorating its insulating qualities below a safe limit. Consequently overload protection is necessary to protect the insulation.

Fuses

Fuses are the most common and universally used overload protective devices. Fuses for industrial distribution systems (less than 600 volt) have two general classifications.

1—plug fuses.
2—cartridge fuses.

Voltage Limitations

Plug fuses may be used on circuits not exceeding 125 volts.

Cartridge fuses have two classifications of voltage limitation. One size of cartridge for not over 250 volt and another size for not over 600 volt.

Amperage Ratings

Plug fuses have two amperage rating classifications; 0-15 & 16-30-amp.

Cartridge fuses have six amperage rating classifications; 0-30, 31-60, 61-100, 101-200, 201-400-, and 401-600-amp.

Markings

All types of fuses must be distinctly marked with amperage rating.

Plug fuses with ratings between 1 and 15 amp. are further marked by a distinguishing hexagonal shape of cap or head.

250-volt cartridge fuses of 15 amp. or less have navy blue labels and green labels for ratings exceeding 15 amp.

600-volt cartridge fuses have red labels for all amperage ratings.

Plug Fuses

Standard plug fuses are not widely used in modern industrial plants, their principal use being on lighting circuits etc. They are not generally relied on for the protection of important equipment because of ease of "tampering" and inconsistency of performance in accordance to their marked amperage rating.

"Tampering" may eventually be reduced by the National Electric Code requirement of using non-tamperable plug fuses after Nov. 1, 1941. Non-tamperable adapters may be inserted in any standard Edison base and cannot be removed without a special tool. The adapter is so designed that fuses of 16-30-amp. size cannot be used in adapters for 1-15-amp. size. It is also impossible to use other than non-tamperable type fuses. It will be extremely difficut to bridge the circuit by inserting coins, tinfoil, or other material.

Cartridge Fuses

Cartridge fuses are made in ferrule contact type for amperage ratings of 0-60 amps. and knife blade contact type for 61-600 amp. ratings.

Both types are made with either renewable or non-renewable fuse links.

Fuse Construction

All types of cartridge fuses have the same outside dimensions in each of their respective voltage and amperage ratings. However, the different "makes" of fuses vary greatly in their mechanical construction and quality of material used.

The barrel of the fuse is made of fiber. The safety and economy of the fuse is governed by the quality of fiber used.

The brass ferrules and metal caps of the fuse ends serve to make contact with the fuse clips, connect fuse links and govern heat radiation. Consequently the efficiency of the fuse depends greatly upon the construction of these metal parts.

Sometimes the metal contact parts are silver plated to improve contact efficiency, by reducing oxidation. For use in corrosive atmospheres the metal parts are chromium or nickel plated.

The construction of the inside parts of the fuse varies greatly with the different brands of fuses. However, simplicity of design, with as little space taken up by parts as possible, will assure adequate ventilation, facilitate handling and aid maintenance.

Non-Renewable

Non-renewable cartridge fuses are commonly called "one-time" fuses. They consist of a wire link soldered to the ferrules and the fuse barrel packed with fire-resistant, non-conducting powder. For initial installation they are cheaper but, with replacement, soon prove more costly. Consequently, industry in general has turned to the use of renewable fuses.

● ASSOCIATE MEMBERS OF EMEA; electrical manufacturers, distributors utilities and many other interested businesses displayed and demonstrated the latest developments in industrial electrical equipment and processes at the December meeting of the orgenization held on the 16th of the month. Over thirty displays were shown, featuring all types of industrial lighting and power equipment This was the annual meeting known as the "equipment exposition"

Fluorescent

Who

San Francisco general offices of Owens-Illinois Pacific Coast Co. Installation designed by Westinghouse engineers.

The Need

Even, shadow-free light for office workers handling calculators, office machines and doing close figure work.

Conditions

Previous installation was comprised of 90 enclosed glass fixtures which were mounted on 9- by 10-ft. centers, 10 feet above the floor, and equipped with 200-watt incandescent lamps.

Installed

Parallel continuous strips of Westinghouse type 2-CL-40 fluorescent luminaires and extensions, each approximately eight feet long and housing two four-foot 40-watt white fluorescent Mada lamps. The lamps are operated from two-lamp ballasts to minimize stroboscopic effect. The installation in this general office includes 104 type 2-CL-40 units and extensions, housing a total of 208 F lamps.

Results

Mounting height of 10½ feet and a distance of 9 feet between parallel strips, assures high, even illumination on all working areas in the office.

LIGHT for a GENERAL OFFICE and for a DRAFTING ROOM

Incandescent

Who

Drafting room of the Seattle-Tacoma Shipbuilding Co., Seattle, Washington. Installation by engineers of Illumination Division, City Light.

The Need

Fairly high intensity of well diffused light, with the low ceiling and units themselves not excessively bright. Tests were made by representatives of the engineering department of Seattle-Tacoma Shipbuilding Co. and City Light illumination experts prior to this installation in another room of the company's offices where temporary installations were installed and tested in groups of four.

Conditions

Drafting room 45 by 100-ft., with ceiling height of 91ft. 2-in. Ceiling material Firtex acoustical board with one coat of flat white paint.

Installed

Ninety-nine Silvray No. 1500 luminaires with 300-watt bowl silver lamps on suspension, standard for this unit, 10 5/16-in. filament center to ceiling. Spacing is 7-ft., 6-in. by 10-ft.

Results

Illumination after three and one-half months or 1600 hours use, 37 FC average.

What Can I Do?

EVER SINCE that Sunday morning when havoc swooped from the skies upon Honolulu, a new question has been churning about in millions of American minds. It is this: What can I do to help my country win this war?

This insistent question has pushed aside all matters of personal interest. From now on, individual wants and wishes must give way to the paramount needs of the nation. We all accept that. We have undertaken a huge job. Or, I should say, we have had a huge job thrust upon us. And unless we see that job through successfully it won't much matter what any of us may want.

That job is to win this war.

No longer are we trying to prepare for a war that we may get into. Today we are trying to win a war we're already in—and in up to our eyes. Nothing that any one of us now can do to help himself can get him very much if it does not also help our country to win this war.

I am sure that those who read these words will find many things to do. Some will enlist in the armed services. Some will become active in civilian defense. Some will labor to relieve distress in their home towns. Some will work with organizations set up to serve the men at the front. Each can and will find something he can do.

But this insistent question "What can I do?" goes beyond the individual and his personal service. It re-echoes through the offices and the shops of every American business concern. And what I have to say here is not directed toward individual effort. Rather is it intended for the men and women of American industry who make that industry a living part of American life. Today they are asking themselves: What can industry do? Or better still, what *must* industry do if our country is to finish the job it has started?

Those of us who work in and with American industry have one supreme obligation. We may feel very patriotic; we may be willing to serve "in any capacity;" we may be willing to sacrifice . . . if necessary. But if we fail to meet that one obligation, we shall fail our country in its time of need.

THAT SUPREME OBLIGATION IS AN HONEST DAY'S WORK, EVERY DAY, FROM EVERY MAN, EVERY WOMAN, EVERY MACHINE. . . .

IT IS AS SIMPLE AS THAT!

And that goes for all of us, whether we are engaged in civilian production or working directly on the weapons of war. American victory can be won only through the productivity of American industry.

Efficiency in production is not the responsibility of a few. It can be achieved only as we all put to useful purpose every minute of our time, every ounce of our energy, and every pound of our materials.

This responsibility of industry is the more vital because of what has happened to the business of making war. There was a time when success in war was chiefly a matter of well-trained, well-disciplined armies and competent leaders—when men were everything. In those days, military strength was a matter of strong battalions and able generals. Both still are vital. But today military might is essentially mechanical might. Modern war is an industry just as much as a factory or a railroad. In the first World War, mechanical equipment was relatively simple and limited. But today the special equipment of war and the expert skill needed to use it spell the difference between victory and defeat.

We Americans are not expert war-makers. That is why we must expect to suffer grievous losses before we can win substantial gains. We do not have military training and experience ready to hand when we need them. Neither do we have, ready for action, enough of the machines that are so essential to modern warfare.

So, when it becomes necessary to fight for our lives, we must start from scratch. And today, after a year's effort, we still are not ready to trade blow for blow with enemies who for years have schooled their leaders, trained and disciplined their people, and organized their industries to make war. We shall need more time to develop our strength. And while we are doing that, we must expect reverses.

But there is a brighter side to all this. For it follows that if we are granted this all-important time, the change in the method of warfare is right down our alley. The greater importance of mechanized equipment plays straight into the hand of the world's greatest industrial nation . . . if there is one thing America does know, it is industrial production! Our industries know how to produce. They have the skilled manpower. They have the organized facilities. Beyond any doubt, we can produce all that we need to win the victory that we *must* win—if only we are given the time.

THE FIRST RESPONSIBILITY OF THE ARMED FORCES IS TO GAIN THAT TIME FOR US.

THE FIRST RESPONSIBILITY OF INDUSTRY IS TO USE TO THE FULL EVERY SECOND OF THAT TIME IN PRODUCING THE WEAPONS THE ARMED FORCES NEED TO WIN THE ULTIMATE VICTORY.

INDUSTRIAL PRODUCTION IS THE KEY TO VICTORY. BUT IT MUST BE BIGGER PRODUCTION AND FASTER PRODUCTION THAN WE EVER HAVE KNOWN.

Heretofore American industry has worked to produce more of those things which make our lives more enjoyable. Today it must divert much of its energy from the products of peace to the weapons of war.

This change sets up a new yardstick of industrial performance. In time of peace we measure production efficiency in terms of money saved. From now on, we must measure efficiency chiefly in terms of time saved. For the plane, the tank, the gun, or the ship that is ready when it is needed to win a victory, is worth a million times more than the one that is delivered too late to avert a defeat.

Everyone knows how short we are of some materials and machines. But our most tragic shortage is the shortage of time. So whatever we may waste in the days ahead—and unhappily we are bound to waste plenty—let us never forget that the most deadly waste of all is the waste of time.

Time wasted never can be replaced. No one ever has discovered a substitute for time. If we would avoid the waste of this irreplaceable ingredient of victory, we must use every minute of it effectively—while we *still have it.*

That goes for us all. It goes for the man or the woman at the bench, at the desk, at the counter, in the field, or in the executive office. It goes for the politician as well as for the business man. It goes for the humblest and the most powerful. A nation at war cannot carry deadheads. It cannot spare a square foot for any one who will not pull his weight.

In this war, nothing short of complete victory can save the liberties of us all, rich and poor, employer and employee, haves and have-nots alike. The price of that victory is the labor, the loyalty, and the devotion of every last one of us. Winston Churchill said it well for the British people. You know how he said it. I need not repeat it.

All this imposes upon American industry, its owners, its managers, and its workers, the gravest responsibility they ever have assumed. If our country is to survive as a free nation, American industry must rise to that responsibility. If our country should fall, it would fall because American industry fell short of the need. It would be another case of "too little and too late".

This grave responsibility calls for the keenest management industry ever has known. It calls for unremitting research to make the most of our resources. It calls for the reduction of waste to a record minimum: that goes for waste of time, labor, and material. It calls for keeping our machinery working as near to full capacity as we can contrive. It calls for the highest rates of unit production we ever have known. That will mean skillful coordination by management and the most intelligent cooperation that the men in the shops can give. It calls for inventive ingenuity to match that of a nation which has produced some of the world's outstanding technical genius. For this is a war of technical proficiency.

But above all, it calls for a new devotion to the day's work. For so long as we are at war, the day's work will determine our country's security.

Whatever may be our material resources and our technical skill, however resourceful our management, however broad the scale of our effort, industry cannot measure up to its prodigious responsibility if any of us shirk the day's work. Right there is where we find the *one* thing we *all* can do—the one thing that is within the power of each of us.

THAT ONE THING IS SIMPLY TO DELIVER AN HONEST DAY'S WORK WHEREVER WE ARE CALLED TO SERVE. HONEST WORK WILL WIN THIS WAR. LOAFING WILL LOSE IT. THE SHOWDOWN WILL BE WHETHER HITLER CAN DRIVE HIS PEOPLE TO WORK HARDER THAN WE ARE WILLING TO WORK. THERE IS NO ONE TO DRIVE US. WE MUST DRIVE OURSELVES!

Is that so much to ask? It is all our country asks of us, the men of industry. It is all that the men who must work the guns and tanks in the field ask of us. It is all that the men who work our ships and our planes ask of us. "Give us the planes, the guns, the ships, the tanks, and all the rest of our tools, they tell us, "and we'll give you the victory that means so much to us all. But, in the name of that victory, give them to us quickly—QUICKLY—QUICKLY!

Is that, I repeat, too much to ask of us?

* * * *

To help American industry achieve ever-higher standards of efficiency has been the traditional mission of McGraw-Hill for three-quarters of a century. Normally that effort has been directed toward higher efficiency in the business of peace. But, as in the first World War, twenty-five years ago, it now is directed toward efficiency in the business of war and in every department of American effort that can contribute, directly or indirectly, to the achievement of victory.

And to that mission, I here pledge every resource of this company, its publications, its books, its staff, and every service it is qualified by experience and training to render to American industry, now enlisted in our common cause.

That is what *we* of McGraw-Hill can do. And that is what we *shall* do to our utmost.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

This message is appearing in all McGraw-Hill industrial and business publications, reaching over a million readers.

ELECTRICAL WEST

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What We CAN Do

"WHAT can I do?" is the question posed by James H. McGraw, Jr. on the preceding pages. He answers it for business and industry generally. Here is the answer specifically for the electrical industry in the West and its people:

Because electric power is the force behind the prodigious and productive industrial machine that will bring ultimate victory, we can see that this power supply shall not fail. Electric power isn't like steel or copper or lumber—if one source of supply fails, another can be substituted. The electric utility by and large carries its load alone except as system interconnections provide for some emergencies. However, the supply of power *locally* is the thing. To see that this supply does not fail is the responsibility of each individual as a part of the overall team. That goes for the contractor who may be called upon for emergency repairs, for the wholesaler or manufacturer who must furnish emergency equipment.

In addition to this basic responsibility there are other ways of helping. Financial sacrifices will be necessary to buy the stamps and bonds and to pay the taxes to finance the war effort. We must learn to save every useful thing—paper, metals, rubber and countless other materials needed for production. We must volunteer for work over and above the normal day's effort of our particular job. This can be for any part of the civilian defense program. But there should be this exception: Utility operating people should not volunteer, because they will be needed on their own jobs if emergencies arise.

The prime objective of everyone of us would be to contribute our part to the ultimate victory. To win, we are going to need cool heads, sound thinking, personal sacrifices and unstinted work. We CAN do it.

Out for the Duration

THERE should be only one principal business in America today—that of winning the war. Every resource should be dedicated to that effort. All of the social planning, idealistic scheming and political log-rolling that has been interlinked with the defense program before the declaration of war should be out—for the duration. That goes particularly for the endeavors of those political zealots who were making issue out of the public-versus-private power controversy. With every kilowatt-hour of electric power needed for war production for victory, with every trained engineer, operator, worker and executive essential to this great effort, there can be no time for disruptive, useless battling for or against public power. The private utilities are being called upon to make their sacrifices. The political proponents of public power should do the same. Internal dissension should stop—for the duration or longer.

The Blackout Came

AMERICANS love drama. It was only natural then when we went to war we jumped in dramatically and demanded all of its trimmings, even the blackout. So remote had been the very idea of a blackout in America just two days before that no preparation had been made for it. Consequently when sirens shrieked few people knew why. Radios went dead so there was no way to tell them what to do. The first blackout was pretty poor as a blackout, and the army growled and issued warnings.

A second blackout was a success, for the first taught everyone what to expect. The hysteria of the first, with tragedy and needless destruction by overzealous and often self-appointed "wardens" in its wake, had taught a lesson.

But if the blackout taught the public a lesson, it is to be hoped that it taught public officials and army officers something, too, about electricity. The number of ranking officers who made ridiculous demands to cut all electricity off at the main switch, or what was more impossible, to dip the lights as a warning, was an amazing revelation to electrical engineers. *Their* unpreparedness to the realities of electric distribution, whatever their other defense training, was as much to be criticized as

that of the public for not heeding blackout alarms.

Suddenly a large part of the public, including army and navy and city and state officials, was made conscious that electricity was a necessity, even if lighting was completely obscured, that it performs so many of its everyday functions automatically. Street lights and signs are clock-operated and seldom need manual control. Light is used in a thousand ways that people so take for granted that they never are conscious of it.

But it is to be hoped that army and public officials now appreciate that when the people in the electrical industry are given a job to do, they do it quickly and thoroughly. When the second blackout came, it worked—even the thousands of time-clock controlled circuits were handled in one way or another. And the electrical industry is on the alert now for any future blackout. Let no one say that the industry did not take it on the chin financially from the blackout without a whimper. Economically a real air raid could have done no more damage than this drastic curtailment of lighting has already caused.

Now that the test has been made and methods of blacking out have been developed to make future response quicker and more effective, may ELECTRICAL WEST suggest to those in authority that a revaluation of the whole subject be made in a calm, analytical and thorough way, without haste or prejudice. Some of the suggested alternatives to a blackout should be investigated, other methods of protection against air raids encouraged and developed. There is enough ground to question the relative effectiveness of the blackout as a means of protection to warrant a more thorough engineering investigation of the entire problem.

Meanwhile let no one relax his vigil or be slow in his response to the army's orders to black out. For his own comfort and peace of mind let him make provisions to continue his regular activity in quarters prepared to keep light in. Let no one grumble at the sacrifice entailed. First things come first, and this precautionary measure is a first.

Then in due time, let experiments and study determine whether some better method may be devised to cope with this danger. There is promise that light may be a better weapon than darkness.

Always Something to Sell

WAR, the scarcity of materials, taxes, manpower—these are the things that will affect promotional techniques in the months to come. Obviously there must and will be changes in methods and in types of promotion dependent upon the locality in which a utility operates. But we offer this fundamental observation: If the utility neglects to continue its promotional efforts on some plan suitable to the region in which it functions, it is placing in jeopardy its future development, its standing and its prestige.

Any successful agriculturalist knows that an orchard without fertilizer and water will soon fail to bear fruit. Year after year, he fertilizes, cultivates and waters his trees. Some years he fails to make expenses; other years he may break even; and other years he reaps a bountiful harvest. He has learned, usually by bitter experience, that this program assures an overall return. Any other system may bring temporary harvests, but in the end the orchard suffers. Nor can he leave the job for others to do, since they will stop their fertilizing and cultivating just as soon as returns drop off.

For the same reasons, this is no time for the electric utility to cease its promotional efforts. It is essential that customers be cultivated for added service against that day in the future when they will be able to purchase the appliance to use that service. Here again, outside sources cannot be depended upon to furnish that promotional effort.

Because they must depend upon continued and increased use for future growth, the utilities must continue to cultivate throughout this emergency period. And there are many ways of keeping the use and popularity of electric service before customers. Some of these methods will fit any particular community or situation. The thing to be sure of is that some method be used. Every utility has trained sales organizations. It would be shameful to let these people be taken away for other work. Their training and value is too great. They can be directed into promotional work that will bear the greatest fruit in future years. They can see that present users maintain their use. They can help in organizing service stations for appliance dealers. They can instruct customers in the better use of present equipment. They can demonstrate time and labor-saving uses of present equipment.

Such a long-time program will be insurance against future losses. It will provide assurance of future growth from present users. It will mean kepeing the orchard watered, fertilized and cultivated for the certain crops that must be harvested when the war emergency passes.

I WOULD like to see all of us now rededicate ourselves to our country's cause and say, with Adams, Jefferson, and the others who founded it: "We mutually pledge to each other our Lives, our Fortunes and our sacred Honor"—and from this time henceforth we are not business men, consumers, capitalists or employees, but Citizens.
—A. W. Robertson, chairman of the board, Westinghouse Electric & Manufacturing Co.

NEWS of the industry

PGE BONNEVILLE POWER CONTRACT NOT RENEWED

Negotiations for a power contract between Portland General Electric Co. and the Bonneville Power Administration broke down, and the company's present contract for the purchase of 30,000 kw. of firm power from Bonneville expired at midnight Dec. 10, having been twice extended from Dec. 1. Bonneville did not, however, "pull the switch," and is now serving the company just as it did under the expired contract but on a day-to-day basis. The company refused to accept the terms offered by the Bonneville administrator which included the provision that in order to get a short term contract the company must agree to sell its Woodburn properties to the city of Woodburn, Ore., and its Clark County, Wash., properties to the Clark County PUD. The company offered a counter proposal that proved to be unacceptable to the Bonneville administrator.

In this counter proposal, the company presented itself as an "unwilling seller," but stated it would agree to sell its properties in their entirety if and when the "municipal corporations then representing a majority of the population in the area served by the company have declared that such municipalities desire to own the electric distribution system serving them," and that in the meantime the Bonneville administrator make no request of the company for the sale of any portion of its system other than the Clark County and Woodburn properties. A further provision insisted upon by the company was that such sale of the entire property should be negotiated only if and when Bonneville should be authorized to purchase the property and should have the money available for such purchase.

During the negotiations Dr. Paul J. Raver, Bonneville administrator, repeatedly asserted that if the company did not renew its contract on his terms he would discontinue serving the company with any of its base load, but would stand by to furnish the company its peaking requirements over and above the company's own generating capacity. Such an arrangement contemplated that the company would fire up all its steam plants, but since hog fuel supplies are low and additional supplies limited, it would mean the burning of 1,100,000 bbl. of oil per year. This is enough oil to keep one tanker busy plying from California oil ports to Portland for five months.

The company pointed out that if Bonneville cut off its base load supply, water would be wasted at Bonneville. Bonneville has no large new user coming on until the Troutdale aluminum fabrication plant in April or May, 1942, which will take 60,000 kw. In March 1942, Grand Coulee is expected to come on the lines with an additional 105,000 kw.

Must Have FPC License

Pacific Gas and Electric Co.'s Pit No. 5 hydro plant must have a federal license according to an opinion just handed down by the FPC. The opinion holds that the plant would affect the navigability of the Sacramento River into which the Pit flows and hence influence inter-state commerce. FPC also avers that US lands on which plant No. 3 and No. 4 are located would be affected. Pit No. 5 was being constructed in lieu of two Feather River plants for which PG and E refused licenses.

Machinery Being Installed In Shasta Dam Power Plant

Installation of power machinery has begun in the Shasta Dam power house. Inundated ten times last winter by heavy floods, the power house now is sufficiently far along to permit erection of steel plate liners for the draft tubes. This will be completed for No. 4 turbine by March 1 and erection of the scroll case will then commence.

Two of the 75,000-kw. Shasta generators have already been shipped. One machine is stored at Boulder Dam and the second partly there and partly at Shasta Dam. USBR engineers are endeavoring to have the power house ready so that power delivery can start late in 1943 or early in 1944.

● PUBLIC SERVICE CO. of Colorado reports that a combination of Christmas lighting and public interest in war news brought electric consumption generated by the central system to more than 2,000,000 kw.-hr. on Dec. 10, a new record. One year ago, the peak sendout, between 5 and 6 p.m. was 103,000 kw.-hr. as compared with 121,000 kw.-hr. on the same date this year.

$30,000,000 ALLOTTED FOR BONNEVILLE LINES

Appropriation of an additional $30,000,000 for Bonneville-Grand Coulee transmission facilities included in the third supplemental national defense appropriation bill, presages a rapid expansion of the government's Northwest network. According to Dr. Paul D. Raver, war in the Pacific will necessitate readjustment of the Columbia River power distribution program to accommodate defense plants located east of the Cascade mountains.

Included in the immediate expansion plans announced by Bonneville Administrator Raver, will be a second 115-kv. circuit down the Willamette Valley to Eugene. The new line will supplement the present circuit (on which earnings to date have been negligible) so that "the administration will be in a position to wheel power south through interconnections in event of damage to vital California generating plants." In case of emergency, an interconnection would be made with the California Oregon Power Co., Raver stated.

The transmission system project contemplates handling the complete output of the Bonneville and Grand Coulee power houses when the ultimate installations are made.

$50,900,000 Aluminum Plants For Southern California

Pacific Coast aluminum production capacity has been increased another 120,000,000 lb. annually with the signing of contracts for the erection of an $18,000,000 reduction plant near Torrance in southern California. Only in this case the total investment in facilities will reach $50,900,000 because in addition to reduction, plants will be built for fabrication of the metal.

Included in the construction program are a $5,300,000 extrusion mill, a $5,600,000 forging plant and a $22,000,000 rolling mill. All plants are being built by the Defense Plant Corp. and will be operated under lease by private concerns.

Power will come from Boulder Dam.

● FUNDS TOTALING $3,000,000 for work on a $23,000,000 transmission line from Shasta Dam to Antioch were included in the third supplemental national defense appropriation bill passed by Congress and signed by the President.

Saves Fluorescent Installation and Maintenance Time

Westinghouse has reduced the job of industrial reflector attachment and removal to a simple "twist of the wrist." A mere quarter turn of two tension locked thumb latches instantly attaches or detaches the take-down reflector. No tools are required. There's neither wasted time nor effort in installation, maintenance or servicing.

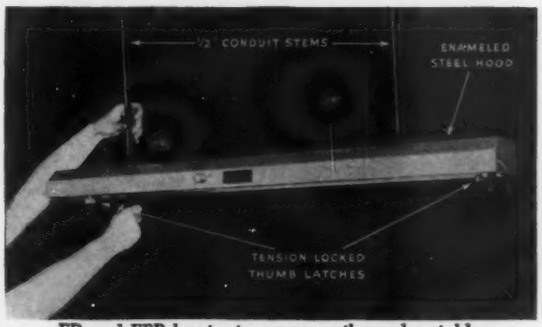
For general or supplementary lighting, Westinghouse provides two types of RLM, porcelain enameled units: Type FP, with closed ends; and Type FPR, with open ends. Both reflector types fit the same auxiliary-equipped hood. Units are furnished completely wired for 40-watt and 100-watt lamps and for new RF-85-watt lamps in open-end reflectors.

These quick-installation luminaires produce high-intensity illumination without annoying glare, harsh shadows or objectionable heat. They typify the contribution made by Westinghouse *engineered seeing* to practical and effective industrial lighting.

Engineered seeing—based on properly designed equipment and sound application—is available through your nearest Westinghouse Lighting Distributor. Ask him today for Fluorescent Catalog F61-000. Or, write Westinghouse Electric & Mfg. Co., Edgewater Park, Cleveland, Ohio.

★ ★ ★

Engineered seeing is available through 117 Westinghouse Electric Supply Company offices and Independent Lighting Distributors.



FP and FPR luminaires are easily and quickly installed. Units are arranged for rigid or flexible conduit, or for chain mounting.

Fluorescent ballasts, starters and lamp holders are mounted in the hood. Line connections are quickly spliced to fixture leads.

Porcelain enameled, take-down reflector is attached to the hood by a quarter turn of two tension locked thumb latches.

Westinghouse LIGHTING EQUIPMENT

BLACKOUTS AFFECT LOADS AND CAUSE CONFUSION

The first week of conflict between the United States and Japan impelled a series of intermittent, improving blackouts on the Pacific Coast—with the results to the utilities clearly manifested in the report of energy generated for the region for the week ending Dec. 13: An increase over the same week in 1940 of only 6.8% as compared with 10% for the previous week. This indicates that sporadic blackouts had cut energy consumption an average of 3% for the various utilities. The drop varied with different companies due to local restrictions.

The most severe reduction, as might naturally be expected, was reported from Manila where the output of the Manila Electric Co. was down 30% from the preceding week and 26% below the same week in 1940. Prior to the onslaught, increases had been running 9% over that year. Hawaiian Electric Co. reports are not yet available, but this island utility, which serves Honolulu, has sent word that none of its major facilities have been damaged by the opening attack on Pearl Harbor.

Certain unsatisfactory experiences occurred in the early blackouts, which should serve as a guide to utilities in other sections where similar conditions might arise. Most confusing and potentially serious was the initial lack of centralized authority in ordering circuits turned on or off. Army, Navy, municipal officials and civil defense officers all had different ideas and issued contradictory orders in several instances. This situation has been remedied by placing full authority in the hands of the Army Interceptor Command.

Among the severe, unusual operating problems that occasioned criticism from the lay public was the difficulty in Los Angeles of prompt control of some 800 separate ornamental street lighting circuits involving 60,000 lights scattered over 450 square miles. Normally, the lights are controlled by astronomical clocks connected to each circuit. During the first major southern California blackout they were not turned off in many instances because workers of the Bureau of Power & Light, assigned to the task of pulling the switches, were prevented from reaching their destinations. Their automobiles were stopped by soldiers, police and congested groups of citizens. Although the Bureau men bore proper credentials, in numerous cases they were forced to abandon their cars in the streets and were themselves forcibly detained by overzealous officials and self-appointed wardens.

As alarm subsided over possible raids from carrier-bivouacked planes, some of the stringent restrictions regarding sign and decorative lighting were modified. Latest blackout ordinance in San Francisco, for example, permits all such lighting on the condition that circuits are manually controlled and a responsible individual is available to turn them off within a moment of the siren alarm. Virtually all industrial plants have installed blackout provisions to allow unhampered night shift operations. One major exception is the Bay area shipyards where work is carried on outdoors.

Opportunists among hardware and building supply dealers have leaped to the fore with a considerable array of blackout materials and services. In many instances, the immediate buying reaction to offers of materials have swept the dealers completely out of merchandise and the blackout boomlet. Stores and places of entertainment that have installed blackout arrangements now rely on this reverse attraction from brilliant lighting to bring wary customers into their houses.

Portland Load Drops

Blackouts in the Portland, Ore. area during the first few nights of the Japanese war cost the utility companies of that city the loss of kw.-hr. sales approximating 6.7 per cent. Portland General Electric Co. and Northwestern Electric Co. with an average combined daily output at this time of the year of 4,500,000 kw.-hr. reported a daily drop off in output Dec. 8 to 15 of about 300,000 kw.-hr.

When nightly blackouts were discontinued Dec. 15, this load did not immediately come back in full for the reason that citizens and businesses having signs and other outside lighting were required to turn off such lighting early in the evening against the possibility of the calling of an emergency black-out during the night. Later these restrictions on outside lighting were lifted provided users were equipped to blackout their premises within 10 min. notice. This liberalization of restrictions, however, was still a deterent to the full use of signs and some window lighting, so that output and demand during the night hours is still somewhat off from normal.

On the first night of the blackout, Dec. 8, when the blackout time began at 11:00 p.m., drop in kw. demand commenced about 10:00 p.m. and increased sharply until at midnight it amounted to 47 per cent. In other words, the load at that hour was only 53 per cent of normal. On the nights following Dec. 8 when the blackout time was scheduled to commence at 1:30 a.m., the drop off in kw. demand during the early morning hours ran from 15 to 25 per cent.

It was necessary for the companies in the early stages of this blackout experience to cut off certain street lighting circuits in the early evening. Now control circuits for some of these are being installed to outlying substations where by relays these circuits can be controlled from major substations that are manned 24 hours a day, and companies improving their services under conditions calling for prompt emergency action.

Vancouver Industries Stop

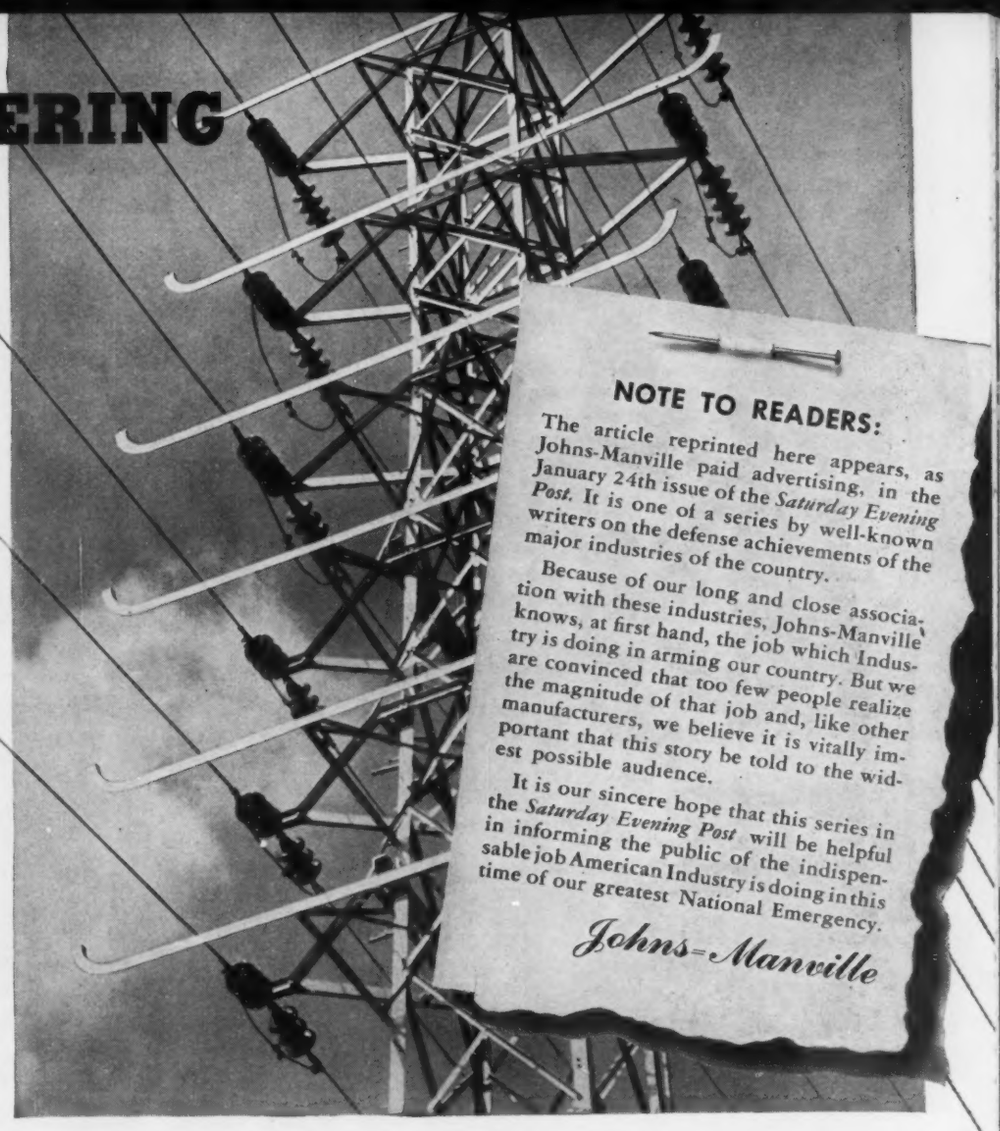
Blackouts which started on the second night following Japan's entry into war, have been extremely costly for British Columbia industries. Official government orders said that blackouts were to be continued until further notice and coastal authorities stated that danger was at hand and hostile planes were expected off the coast. It was generally believed, however, that these reports were merely used to create an impression on the part of the public that these blackouts were genuine and that once all necessary steps had been taken so that a complete blackout was possible when necessary, the restrictions would be relaxed.

In the case of many B.C. industries, however, a blackout is an impossibility. For example, the shipbuilding industry, the sawmill industry, the pulp and paper mills and many other plants cannot blackout their operations. During the first nights of the blackout all shipyards came to a standtill, refuse fires were dampened down in over 40 sawmills and presses in five of the largest pulp and paper plants on the Coast rolled to a stop. Factories that could convince air raid wardens of their ability to operate without showing exterior light were given permission to run their usual schedule but very few of the larger industrial concerns were able to comply with these requirements.

It was estimated that over 7000 workmen on night-shifts would be thrown out of employment as the result of the elimination of these operations during night hours if a solution was not found. Cost of the blackout was estimated at over $200,000 per night for Vancouver alone, mainly war production. Shipyards, engineering plants and machine shops who employ over 2000 men on their night shifts were compelled to lay off this portion of their payroll.

THE CONQUERING KILOWATTS

by Lowell Thomas



NOTE TO READERS:

The article reprinted here appears, as Johns-Manville paid advertising, in the January 24th issue of the *Saturday Evening Post*. It is one of a series by well-known writers on the defense achievements of the major industries of the country.

Because of our long and close association with these industries, Johns-Manville knows, at first hand, the job which Industry is doing in arming our country. But we are convinced that too few people realize the magnitude of that job and, like other manufacturers, we believe it is vitally important that this story be told to the widest possible audience.

It is our sincere hope that this series in the *Saturday Evening Post* will be helpful in informing the public of the indispensable job American Industry is doing in this time of our greatest National Emergency.

Johns-Manville

ONE of the absolutely prime requisites for national defense is *power*—power to put industry in high gear—power to do the almost inconceivable task that lies ahead. For power is the parent of every gun, every tank, every plane, every ship. It is truly America's first line of defense.

How *much* power can America produce?

It took a little digging on my part to discover that, right now, our power capacity exceeds that of Italy, Germany and Japan *combined*. Today we have fifty-five million kilowatts. Within another year American capacity will be at least sixty million kilowatts . . . sixty-four million by 1944.

Simple Terms

Those are big figures, but what do they mean, brought down to simple visual terms? Well, one kilowatt is the same as one and one-third horsepower. That means a single kilowatt has the working strength—the actual physical energy—of 14 strong men. On an efficient treadmill they would be able to lift 500 pounds one mile straight up in the air in an hour . . .

Now multiply those 14 husky men (equal to one kilowatt) by the more than 100 billion kilowatt hours that were sold by power companies last year and you would have power equivalent to more than *seven hundred million men*, working forty hours a week, fifty weeks a year!

Just look what that means! Seven hundred million of these mechanical workmen are enough to provide the equivalent of more than twenty workmen for every family in America . . . And you and the munitions factories can *get* those mechanical men to work at the snap of a switch! You have here, it seems to me, a beautiful example in strictly human, flesh-and-blood terms of what American power engineers have been able to do to reduce back-breaking toil—to make life more worth while for all of us—and to speed national defense production in our present emergency.

Power Enough Exists

The facts support our power company executives when they say we will have enough power to meet any immediately foreseeable demand.

"Okay," says the Man in the Street, "we've got enough kilowatts—millions more than Hitler has. But how do they compare to the requirements of defense plants, and can they keep our houses and stores lighted and run our non-defense factories at the same time?"

That was what I asked Colonel H. S. Bennion, Vice-President and Managing Director of the Edison Electric Institute, which is, among innumerable other activities, the central information bureau of the Power Industry.

"Speaking in general," said the Colonel, "there are plenty of kilowatts for every purpose at the present time, despite the heavy defense loads we have taken on

"You see, the electric industry maintains in normal times a reserve generating capacity averaging about 35% over normal requirements. This is a reservoir of power that can be tapped to meet extraordinary needs.

"And there is still another reserve that can be utilized," Colonel Bennion continued. "The 'peak load' is sustained for only about four hours a day. The other twenty hours we operate at only 45% of total capacity. Merely by re-adjusting working hours in a certain percentage of factories, we could thus add another ten per cent to the juice available without switching in a reserve generator or using any of our reserve fuel."

"Have most of the additions in our power capacity been in Federal plants like T.V.A., Bonneville and Grand Coulee?" I queried.

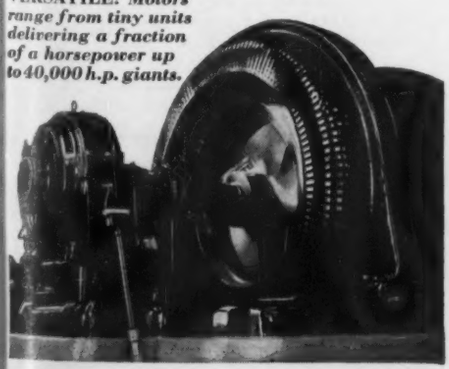
"No. Those are big plants and they're doing a swell job," the Colonel replied, "but it's our electric companies, operated under efficient American business management, who are responsible for carrying out the major part of our power preparedness program. All the Federal Government power plants together supply only a little more than 7% of the nation's power—municipal plants perhaps another 5%. The great majority of power is generated by privately owned and financed companies. Perhaps I should say publicly owned and financed, because their stockholders are numbered in millions."

That is the broad, general statistical background of Power in Defense. Adequate power now and expanding capacity for future needs.

Doers—not Talkers

Power men are all a good deal like the quiet, efficient mechanisms they tend and operate.

(*Continued on next page*)



VERSATILE! *Motors range from tiny units delivering a fraction of a horsepower up to 40,000 h.p. giants.*

This is the seventh of a series of advertisements sponsored and paid for by Johns-Manville. For more than 80 years this company has been serving America's basic industries.

How indispensable these industries are to the American Way in time of peace is generally recognized. This series is to help inform the public of the indispensable job these industries are doing in this time of great National Emergency.

Johns-Manville is proud of the contributions its products are making in helping the Electric Power Industry, as well as other industries, produce defense material quickly and at the lowest possible cost.

JOHNS-MANVILLE

THE CONQUERING KILOWATTS

(Continued from preceding page)

They function with little sound and no fury. And while they have plenty of imagination in doing their work, they don't allow themselves much in talking about it.

They'll tell you casually about spanning fifty or a hundred miles of wilderness with a 25,000-kilowatt line to a new training camp or an armament plant. But they won't speak of the eighteen-hour days of executives who don't get home to dinner once a week, of engineers whose cots are set up beside their drafting boards, of purchasing and material men who plead and wheedle to get supplies, and of surveyors, right-of-way men, diggers and bulldozers and foresters and linemen who clear the path for the power and erect the high voltage lines along which the kilowatts travel.

Keep 'em Marching!

"Our job is to maintain supply," said H. F. Smiddy, operating head of Electric Bond and Share Services, who was interviewed together with President F. W. Bird of Montana Power Company and Kinsey Robinson, President of Washington Waterpower.

"In other words," said Mr. Bird, "it's our job to keep the kilowatts marching and bring up the reserves as commanded." "And it is noteworthy," said Mr. Smiddy, "that it is the integration of corporate structures that has made possible the interconnection of once-scattered individual operating companies so that power can be spread or concentrated where and when it's required for defense."

"For example," said Kinsey Robinson, "an aluminum plant, which burns up more power than a city the size of Spokane, might be placed, for strategic reasons, in a district where the local power supply was inadequate. But through interconnected lines we could shunt enough power from the surplus of other companies in the system to wipe out the shortage."

"And if there isn't a line to that local plant," added Mr. Bird, "we string one, and the kilowatts get there. I don't know of an important instance in the whole electric network of the country where a power need for a defense plant hasn't been met on time or ahead of it."

Expansion—300%

Whether I talked with holding company heads or operating company executives, I got the same quietly confident story. I found reason for their confidence in the history of the power industry, which, in the characteristic American way, has expanded 300% in twenty years while the population has increased by but 25%.

Throughout the industry I sensed that a spirit of genuine, cheerful and competent co-operation with the government's all-out defense effort was universal.

I learned, from President E. L. Shea of the North American Company and a representative of American Gas and Electric, that electric expansion programs were begun as early as 1939 in anticipation of growing needs for national defense.

Foresightedly, the industry was mobilizing its kilowatts before the action started. What this means for production, and how promptly the kilowatts can be mustered, is illustrated by just one of the examples cited by President H. P. Liversidge of Philadelphia Electric.

"After nearly twenty years of idleness," said Mr. Liversidge, "Cramp's Philadelphia Shipyard prepared to re-open. The Manager phoned me, 'Can we have power in thirty days?' 'In thirty hours,' I told him, 'if you need it.'

"Perhaps it looked like a large gesture, but I was merely stating a fact. We've been able to take the job of powering a 50% increase in defense production in our stride. Bendix, Baldwin Locomotive Company (making heavy tanks), the Navy Yard, scores of factories making every variety of war machines and supplies—they've all had the power when they wanted it, they'll continue to have it for the duration."

—And that situation in the Philadelphia area isn't at all unique . . .

EFFICIENCY. ***Research has achieved 300% increase in power output from steam-generated electric plants with no increase in fuel consumption!***

A hundred miles out of St. Louis the Army built Fort Leonard Wood, a camp housing 30,000 soldiers, eventually to hold 80,000. Power lines were run from Union Electric's system to the camp—far outside its territory—and the kilowatts marched in and kept the situation well in hand. Other Union Electric Company kilowatts in ample number were dispatched over other new lines to a T.N.T. plant at Weldon Springs, Missouri, and another munitions factory at Burlington, Iowa.

Down in Louisiana a camp for 40,000 men was laid out. The Army asked the Louisiana Power and Light Company for power in ninety days. Delivering that power meant 600 poles, 400,000 pounds of copper, thousands of insulators, hundreds of transformers, and two complete substations. It meant slashing the right of way through brush, swamps and forests. But the kilowatts marched in—in 75 days!

These operating electric companies in an interconnected system cover the country with a vast network. And from Houston to Boston, Jacksonville to Chicago, and San Diego to Seattle, the power needed in any particular spot has been delivered. Power, you see, is as vital to a nation's military production as is blood in your veins. A country can have men and materials (muscle and bone), but it can't produce planes and tanks without the lifeblood of power. That's why, so often, you read about bombing attacks on power plants in Germany, Occupied France and Italy . . . That's why, when they had to retreat from the Dnieper River, the Russians blew up their beloved Dnieperstroy Dam. Power means production. Production—enough of it in time—means invincible military strength.

In America all our defense demand, up to now, has been superimposed upon the normal, non-defense requirements of light and power. Utility men say that defense production can be greatly increased and still be handled without cutting the householder's lights or power for luxury items. But they foresee—and business indices already indicate—that defense production is bound to cut into non-defense work, which will lessen the civilian and commercial demand for current. This means that the strain on power resources will be in that degree lessened. "Either way," said a power engineer, "the conquering kilowatts will march on."

For this quiet certainty that power will be adequate, the equipment companies are also responsible. They have accomplished literal miracles in supplying the tools of power production. And along with this job for the utilities, the electric powering of battleships, cruisers, airplane carriers for the Navy and the electrification of merchant ships has been increased and speeded to a degree where only "miracle" is the word.

If anybody wants to call me over-optimistic and over-enthusiastic about America's power plant, that's their good American right of free speech. But I believe that the hardest boiled cynic, or even the dourest defeatist, confronted with the facts as I have found them, would have to concede that the intelligence, energy and daring of private industry are doing a dynamic job of power production.

Built the American Way

Here is an industry that was really ready for national defense. Electric power is now driving 86% of the factory wheels of America. And almost nine-tenths of this vast power mechanism was built and operated by private enterprise, seeking an opportunity for profit, in the matchless American Way. In that search were developed new uses and new markets for power, new comforts and standards of living for Americans, at ever higher efficiency and with ever lower cost. Backed by the savings of millions of small investors, private industry has marshalled the peacetime kilowatt forces into an army more than adequate to America's production needs in a wartime emergency.

If the outcome of our battle for Democracy depends on power (and many believe it does) the kilowatts are already becoming Conquering Kilowatts in the service of Uncle Sam. And, as far as I can see into the future, they will *continue* their forward march until that final day when the Conquering Kilowatts of Democracy will light the blazing splendor of our Victory Parade.

This is the seventh of a series of advertisements sponsored and paid for by **Johns-Manville** *and designed to tell the American people how indispensable our basic industries are for National Defense.*

— JOHNS-MANVILLE —

WESTINGHOUSE PRESIDENT SAYS WAR IS PRIME JOB

That management and labor will meet the production demands of the war was the declaration of George H. Bucher, president of Westinghouse Electric & Manufacturing Co., during an inspection of company facilities on the West Coast last month. He reported that following the Pearl Harbor attack he had observed a marked stimulation of production in factories he had visited.

While production of electrical equipment essential to every branch of the defense effort had been the prime job of the electrical industry in 1941, he stated that more and more of the industry's capacity will be turned over to making war materiel. Commenting on the position of Westinghouse in the war manufacturing picture, Bucher drew attention to these facts:

Westinghouse's defense orders since the beginning of the emergency have totaled $400,000,000. Company research is devoted 95% to war problems. Employment is at a peak of 75,000, up 25,000 since the summer of 1940. The Westinghouse backlog of orders represents a year's production. Since the defense program started, the company has spent $28,000,000 on expansion and is building an additional $50,000,000 in plants for the government. Sub contracts amounting to $12,000,000 have been let to 300 firms.

Tacoma Orders Equipment For Nisqually Plant

The Tacoma Board of Contracts and Awards, recently received bids on $1,800,000 worth of equipment needed in expansion of the City Lighting Department's Nisqually project. Low bid was that of the Pelton Water Wheel Co., at $1,228,700 for one 55,000-hp. turbine for the La Grande power house, and for two 34,500-hp. turbines for the Alder power house.

On a 40,000-kw. generator for La Grande, General Electric bid $284,255, plus $20,975 for erection; Westinghouse, $288,799 and $21,200; Allis-Chalmers Mfg. Co., $277,850 and $23,100. Figures were submitted on two alternates for furnishing two 25,000-kw. generators for the Alder power house; for factory assembly, General Electric asked $389,055, plus $27,775 for erection; Westinghouse $409,800 and $27,445; for field assembly, General Electric asked $383,300 and $37,575; Westinghouse, $401,800 and $41,185; Allis-Chalmers, $410,688 and $33,200.

SECOND GRAND COULEE UNIT READY FOR SERVICE

With the second 108,000-kw. Grand Coulee generator ready for a test run the first week in January, the power development program of that project is proceeding apace. A work order for construction of the $4,000,000 east power house has been signed and delivered to Consolidated Builders. Three more turbines and generators also have been ordered.

The second unit will be given a two-week test and adjustment run following which it will begin commercial delivery of power. At that time the initial unit will be taken out of service for a several weeks' checkup and overhaul during which the temporary control mechanism will be replaced with a permanent installation. The third generator will be ready for operation some time in March.

Contracts for three additional units have been let, bringing the total number installed, under construction or on order up to nine. Newport News Shipbuilding & Drydock Co. received a contract for three 150,000-hp. turbines, Woodward Governor was awarded the governors and Westinghouse received the order for three 108,000-kva generators.

The USBR was endeavoring to speed up deliveries of the six machines on order so as to permit operation of three in 1943 and three in 1944. However, due to the material requirements of the Victory Program, it was meeting with difficulties in securing priorities.

● SOUTHERN CALIFORNIA EDISON CO. has requested the FPC to determine an equitable proportion of the charges Pacific Gas and Electric Co. should pay for headwater improvements on the San Joaquin River beneficial to PG and E's Kerckhoff hydro plant.

● BONNEVILLE WILL BUILD a second 16-mile 115-kv. H-frame wood pole line from its Covington, Wash., substation to Tacoma to serve the Olin Corp. aluminum plant. Cost of the line will be $200,000.

● OLIN CORP., Tacoma aluminum reduction plant will receive 46,000 kw. from the Bonneville plant, instead of the 32,500 kw. originally sought, according to Dr. Paul J. Raver.

● FISHERMEN have been denied access to waters adjacent to 11 power plants in southern Idaho in an order issued by the Idaho Fish and Game Commission. The areas will be fenced and armed guards hired in some instances.

America's operating electric companies have undertaken a cooperative national advertising campaign to publish the facts about power production and distribution. The first advertisement of the series told what electric power means to armament production. It appeared in THE SATURDAY EVENING POST, LIFE, COLLIER'S, TIME, and NEWSWEEK. The campaign is sponsored by 52 operating companies scattered from Coast to Coast. It is backed by careful studies and counseled by one of the country's oldest advertising agencies. The present schedule calls for one advertisement every four weeks for a year.

"Johnny, where'd you GET your gun?"

Ease the supply sergeant, of course. He got it from the Ordnance Department—and they got it from a factory. It's the finest Army rifle in the world.

But before one factory wheel could turn—for the first model or the finished job—there had to be *power*—and most of it is *electric*. Electric power helped put your Garand in your hands, Johnny.

It takes a tremendous *lot* of power to make all the guns, tanks, planes and ships we need—but America has a lot. Power reserves, built up in advance by the business men who manage America's electric companies, have been able to meet almost every defense demand overnight.

Requirements keep increasing, of course—and the electric companies are working day and night to keep ahead of the nation's needs. In 1941, they built and installed almost 2,000,000 more horsepower in Democracy's busy arsenal!

You have the hardest part of the job, Johnny, but we're glad we can help by doing our share. We're glad to pledge our wholehearted co-operation with you, the government, and other industries—*to make America so strong it can remain forever free and unafraid.*

This page is sponsored by 52 local electric companies*—all producing power for America under American business management.

*Names on request from this magazine

Invest in America! Buy Defense Bonds and Stamps.

OREGON PUD's SEEK WEST COAST POWER SYSTEM

Price agreements for the sale of the coast and Clatskanie divisions of the West Power Co. in Oregon to the Central Lincoln and Clatskanie County PUD's respectively, have been reached provided the two districts receive approval from the Oregon Hydroelectric Commission and then vote the necessary revenue bonds.

W. H. Duff, president of the Peoples' Light & Power Co., which holds the West Coast common stock, and PUD representatives agreed to a figure of $750,000 for the coast division properties and $150,000 for those in the Clatskanie division. The former would include 85 miles of 11-kv. line, 27 miles of 44-kv. line and 207 miles of distribution lines serving 4,840 customers. Gross revenues for the 12-month period ending Aug. 31, 1941 were $224 000. The Clatskanie properties include 95 miles of distribution lines serving 1.228 customers with a 12-month gross of $61.500.

The Central Lincoln PUD deal hinges in the formation of a new and larger PUD, embracing parts of Coos, Lincoln, Douglas and Lane counties. There is considerable opposition against such a district.

Congress to Hear Testimony On Hetch Hetchy Amendment

Three members of a House subcommittee of the Public Lands Committee spent several days in California in early December, investigating the Hetch Hetchy project and holding a hearing in San Francisico on the Rolph amendment of the Raker act to permit the city to legally sell power generated as a by-product of its water development. The two representatives heard arguments of public power proponents and supporters of the proposed amendment at a meeting on Dec 12; then left for Washington to complete preparations for the formal committee hearings scheduled for Jan. 15.

Promising to "act in a sympathetic way," the subcommittee chairman, J. W. Robinson, said his group was concerned with finding the facts behind San Francisco's repeated refusal to put the city in the power business. In the meantime, San Francisco supervisors have voted a fund of $10.000 to finance the cost of sending witnesses to the national capital.

● RURAL ELECTRIFICATION problems will be discussed at the annual 3-day rural electric conference sponsored by the California CREA to be held at the University of California College of Agriculture at Davis, Jan. 12-14, inclusive. Among the featured speakers will be Prof. H. B. Walker, head of the agricultural engineering division and CREA chairman; P. T. Montfort, research associate from Texas A. & M., and George Kable, president of the American Society of Agricultural Engineers and editor of *Electricity on the Farm.*

Washington PUD's Await Word on RFC Financing

Within the next few weeks, the sixteen counties in the state of Washington which have voted PUD's will learn whether the Reconstruction Finance Corporation will aid them in acquiring properties of the Puget Sound Power & Light Co., according to Jack R. Cluck, attorney for the PUD negotiating committee, who recently returned to Seattle from Washington, D. C.

In Washington, Cluck and Fred J. Chamberlain, executive committee member of the Washington State Grange, conferred with Jesse Jones, federal loan administrator and members of the Washington congressional delegation.

Cluck reports that the power company has declined to "put a price on its holdings until the PUD's have a pledge of necessary financing from the FRC." A bond issue would have to be floated to secure the RFC loan, but Cluck states district directors have authority to do that without holding elections.

Utility districts hope to take over Puget Power distribution facilities, including substations, and let some government agency acquire the generating and transmission plants. This agency might be the Bonneville Power Administration or some other specially created body.

● ELECTRIC RATES of Coast Counties Gas & Electric Co., Santa Cruz, Calif., have been reduced $88,000 annually in an order issued by the California State Railroad Commission. Spread of the cut over different schedules will be announced after conferences are held by the commission.

● AGREEMENT has been reached between the North Douglas Electric Cooperative, Roseburg, Ore., and the California Oregon Power Co. for the purchase by the REA project of 144 miles of rural lines serving about 550 customers. The price agreed to was approximately $200,000.

● REDUCTIONS in commercial and residential rates totaling $12,400 have been authorized for customers of the Southern Utah Power Co. (Cedar City) by the Utah Public Service Commission.

PRIORITIES

In response to many requests, ELECTRICAL WEST will publish in this column monthly a summary of significant priority rulings and a bibliography of pertinent articles on the subject.

P-46 Amended Again

Expansion of property or equipment costing in excess of $1,500 in the case of underground connections or $500 in other cases without express permission of the OEM is forbidden in new amendments to preference rating order P-46 issued Dec. 11, 1941. It applies to privately and publicly owned utilities and to REA's.

Only exception is in the case of projects already under way and at least 40% completed on Dec. 5, and for which the utility has supplies on hand for completing the project or has been granted or is granted priority assistance to obtain them. With that one exception utilities may not withdraw materials from their own stores or inventory without express permission, for projects costing more than the figures previously cited. The ruling applies to all utilities irrespective of whether or not they have previously accepted P-46.

● HOUSEHOLD WASHING MACHINE and ironer production has been further curtailed beginning Feb. 1 by a new OPM order. Existing curtailment quotas were doubled, cutting average production to 60% of the pre-war figures.

● STOVES, RANGES and other domestic cooking appliances have been added to the list of civilian products under mandatory production curtailment to conserve critical materials. Production for the first quarter of 1942 will be restricted by an OPM order that imposes an average 35% cut in the amount of iron and steel used in the manufacture of all types of domestic cooking appliances, irrespective of the fuel they use.

● CEILING PRICES FOR FLASHLIGHTS, batteries and bulbs were set at a figure equal to the highest prices quoted in October and November in an order issued Dec. 9 by OPA Administrator Leon Henderson. The order was to prevent profiteering in areas where shortages developed as a result of the war emergency.

Bibliography:

"What's Ahead for Industry and Why" by Donald O. Nelson, *Factory Management and Maintenance*, December, 1941, p. 50.

"SPAB Freezes Competitive Positions," *Electrical World*, December 13, 1941, p. 97.

NEWS

About The New General Electric Refrigerators

As this advertisement is being written, the United States has just been attacked. What the future may bring, no one knows. One thing is certain. There will be fewer refrigerators produced during 1942—but the new G-E's are equal in all ways and better in many ways than any refrigerators General Electric ever built.

NEW lower operating cost! Basically unchanged, but constantly improved, the famous G-E sealed-in-steel Thrift Unit now uses less current than ever before.

NEW lower cabinet temperatures for better food conservation and better vitamin preservation.

NEW improved G-E Butter Conditioner keeps butter just right for easy spreading.

NEW diamond-hard gleaming white sanitary porcelain evaporator.

NEW tilt-type Dry Storage Bin with 14 per cent greater capacity than ever.

NEW improved compensated controls, **NEW** gray Textolite door strips, **NEW** de luxe styling inside and out—plus Conditioned Air, Selective Storage Zones and all other proved G-E features for greater convenience and economy.

NEW simplified line of models with sound step-up selling features to attract every class of buyer.

AS ALWAYS, the finest and most complete line of electrical home appliances to draw upon for greater volume. You'll Always Be Glad You Sold General Electric!

GENERAL ELECTRIC

BETTER FOOD Means "Health for Defense"

A healthy nation is a *strong* nation and the electric way is the *best* way to insure quality of the finished food. For years LANG has built heavy duty electrical appliances, custom or standard built, to fit the needs of the restaurant, cafe, hotel and institution. LANG electric ranges, cooking tops, griddles, baking and roasting ovens are doing successful work all over the country.

Today many of these LANG appliances are being used by the army, navy and other defense operations. The efficiency, flexibility, speed and long life of LANG electric appliances are reasons for LANG popularity and demand.

If you are planning to modernize electrically, we urge you to investigate LANG. As defense orders must come first we suggest you place orders for equipment well in advance.

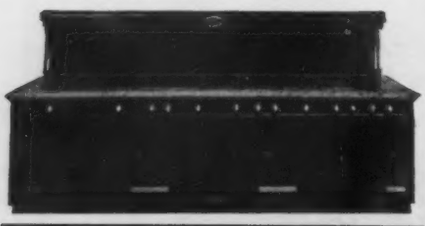
F. S. LANG MFG. CO.

Portland—Seattle—Spokane

Builders of

LANG

STANDARD AND CUSTOM-BUILT HEAVY DUTY ELECTRIC RANGES, COOKING TOPS, OVENS, GRIDDLES.



Answer to "Who Am I?"

See page 51

Hance H. Cleland

Electriquiz Answers

See quiz on page 51

1. False. Five refrigerators may be operated today on the current required by one 15 years ago.
2. True. About one-third of the photo-electric cells used for school lighting in the United States have been installed in Southern California.
3. True. To a lineman, a hot line is one carrying electric energy. To a co-ed—well, ask her.
4. True. The Indiana and Michigan Electric Co.'s new plant has an initial turbine steam pressure of 2500 lbs. per sq. in.
5. True.
6. True.
7. False. Fluorescent lighting made this phenomenal growth.
8. True.

● CHARGING OF SALES TAX on cost-plus-a-fixed-fee contracts has been upheld by the United States Supreme Court. State sales taxes on sales to contractors operating under such government contracts have not been clearly defined in the past. This decision makes necessary the collection from the Federal government, which formerly had refused to pay the states sales taxes, such charges. Attorneys for electrical contractors recommend that sellers to cost-plus contractors collect the tax or get a new ruling from authorities regardless of the position in the past. It is suggested to contractors they request revision of contracts specifically to include sales taxes as reimbursable costs and get the approval of the contracting officer for amounts already paid.

TRADE *notes*

● SAN FRANCISCO DISTRICT OFFICES of Allis-Chalmers have been moved from 116 New Montgomery St. to 650 Harrison St. in that city. In their new location, Allis-Chalmers will combine the district office and warehouse for a-c industrial products. The company's tractor offices for the area are located in Oakland. F. C. Angle will continue as manager of the San Francisco district office.

● C. H. "PONZI" KAUFMAN, during the past 7 years merchandise manager of the Los Angeles Division, Westinghouse Electric & Mfg. Co., resigned from that organization to set up a manufacturers' agency known as C. H. Kaufman & Associates at 443 South San Pedro St., Rm. 306, Los Angeles. Oakland address is 230 Madison Avenue. The company plans a diversified set-up between supplies and merchandise. At present it represents the Philadelphia Electric Mfg. Co., street lighting line for the Pacific Coast, Lumidor Mfg. Co. Inc. of Alhambra on fluorescent lighting for San Francisco and Seattle, and Niagara transformer line for the Pacific Coast.

● ANOTHER SUBSTANTIAL REDUCTION in Mazda fluorscent lamp prices has been announced by General Electric and Westinghouse, effective January 1. Typical are the reductions on the following daylight and white types: 14-watt T-12 from 90c to 80c; 15-watt T-8, from 75c to 65c; 20-watt T-12 from 95c to 80c; 30-watt T-8 from 95c to 80c; 40-watt T-12 from $1.35 to $1.15 and 100-watt T-17 from $3.00 to $2.60.

● GILLETTE & MCLAREN, manufacturers representatives, have moved from the Central Building in Seattle, Wash., to the Fourth & Cherry Bldg., in that city.

MOVED

H. L. MOORE, has announced the moving of Moore Electric Co. from 321 West Third to 727 West Seventh St., Los Angeles.

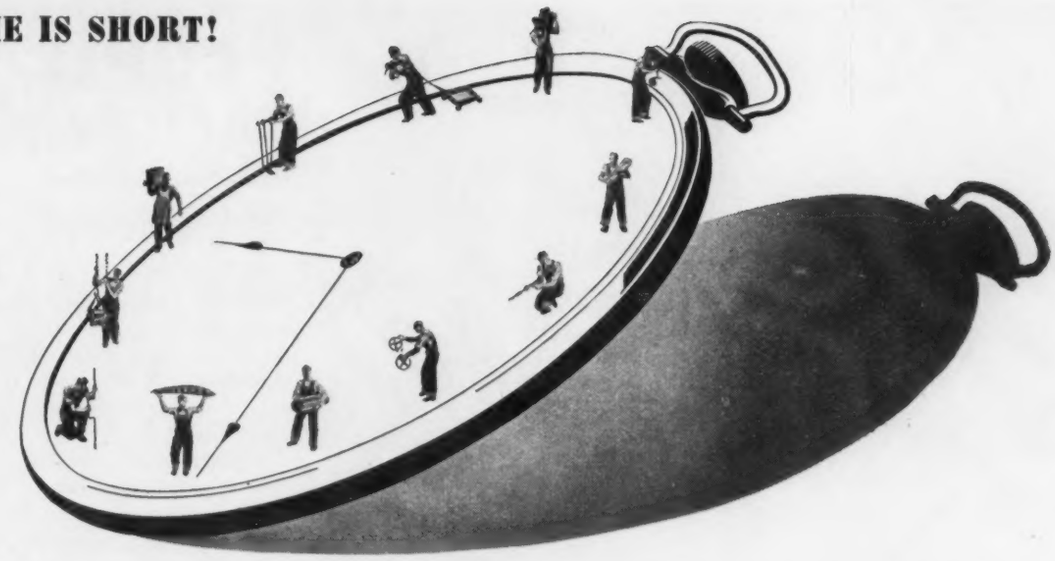
THE COOLIDGE ELECTRIC CO. moved from 13342 14th St., San Leandro, to 1301 Washington Ave.

Ludlow Electric Shop, formerly at 216 West 4th, Pueblo, Colo., moved to 188 Central Main.

Standard Electric Co. of San Francisco moved from 729 Minna St. to 666 Mission St.

L. Roy Moser, electrical contractor, San Francisco, moved from 63 Columbia Square to 128 Perry St., San Francisco.

TIME IS SHORT!



8,760 HOURS TO GO IN '42

Men, make the most of them!

A MILLER Continuous Wireway Fluorescent Lighting System can pack more production to the man-hour in your customers' plants

January 1, 1942 . . . 8,760 hours to go! Golden, *going* hours. Hurry! Hurry!

Industry must put all machines to work. Work machines all the time. Use the most efficient methods. Build an adequate working force. Keep the working force at work.

You can help industry squeeze the last drop of production from each priceless hour by specifying the *proven* value of continuous-row fluorescent lighting, MILLER 50 FOOT CANDLER and 100 FOOT CANDLER. (MILLER TROFFERS for offices and drafting rooms.)

You can help point up the efficiency of its man-power with 50 foot candles or better of matchless working light . . . as many defense plants have done already.

That's why you will find it worthwhile to have all the working details of the MILLER Continuous Wireway Fluorescent Lighting System always on tap. Write today. *(Representatives in principal cities.)*

Be sure your customers get these 5 MILLER benefits when they buy fluorescent lighting

(1) **HIGHER ILLUMINATION—UNIFORM DISTRIBUTION** . . . 50 to 100 foot candles for faster, better production and greater worker efficiency. Production equipment can be moved without changing lighting.

(2) **30 TO 50% LOWER INSTALLATION COSTS** . . . Fixtures contain up to 80% of necessary conduit in continuous wire channels—make defense dollars go further.

(3) **FASTER INSTALLATION** . . . Steps up building schedules — goes in with minimum labor—plants get into production quicker.

(4) **SIMPLIFIED MAINTENANCE** . . . Easy to clean, removable porcelain-enamel reflectors—save valuable man-hours for production.

(5) **ALLOWANCE FOR FUTURE LIGHTING NEEDS** . . . Illumination increases up to 45% practical without new fixtures—completely flexible for greater or less light as needs demand—lower obsolescence.

MILLER

50 FOOT CANDLER
100 FOOT CANDLER
MILLER TROFFERS

Continuous Wireway Fluorescent Lighting Systems

THE MILLER COMPANY
MERIDEN, CONN.
Pioneers in Good Lighting Since 1844

● MILLER offers a complete line of filament and fluorescent lighting equipment.

The search-lights of tonight that can locate flying death in the heavens are far different equipment from the much publicized lights that guided gunfire on Admiral Dewey's ships. Improvements in search-lights during the past fifty years have been comparable with improvements in all electrical equipment. It has been the privilege of the Ward Leonard organization to design and build most of the controls for search-lights through the entire development period. It is not surprising, therefore, that this invaluable experience should be enlisted by our government.

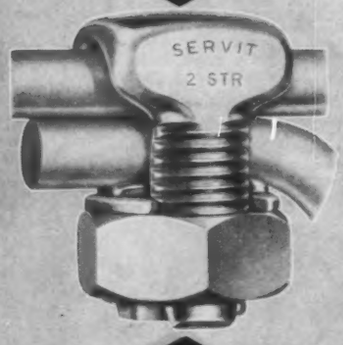
WARD LEONARD

RELAYS • RESISTORS • RHEOSTATS

Electric control (WL) *devices since 1892.*

WARD LEONARD ELECTRIC COMPANY, 48 SOUTH ST., MOUNT VERNON, N. Y.

BURNDY
SERVIT



WILL SPEED UP
YOUR HOOK-UP

BURNDY 107 EASTERN BLVD. NEW YORK CITY

JEFFRIES

TRANSFORMERS

BUILT TO ORDER
IN A HURRY!!

When you are installing or re-arranging—and need a special transformer to exactly match your requirements—call on us. We can deliver in a week to 10 days.

Specify scattered transformers to eliminate duplicate conduit runs and save on power costs.

JEFFRIES TRANSFORMER COMPANY
1710 E. 57th St. Los Angeles, Calif.

PEOPLE
made this news

Lane Webber Elected Edison Vice-President

Lane D. Webber, tax counsel for the Southern California Edison Co. since 1935, has been elected a vice-president of the company by the Edison board of directors. He will continue as tax counsel, in addition to his new duties as a vice-president. Webber is a member of the board of directors of the California Taxpayers' Association. He has served as a director of the California State Chamber of Commerce and has been identified actively with California civic affairs for many years as an attorney, banker and tax authority.

WEBBER

Before his association with the Edison company he was for thirteen years vice-president and trust officer of the First National Trust and Savings Bank, San Diego. He was president of the California Bankers Association in 1930 and has been a member of the executive council of the American Bankers' Association.

Webber was engaged in the practice of law before his association with the First National Trust and Savings Bank and during his many years of residence in San Diego was prominent in the city's two international expositions and administration of its chamber of commerce.

● Dr. Arthur W. Nye, head of the physics department of the University of Southern California, Los Angeles, and a former chairman of the Southern California section of I E S, has been appointed to membership on the national committee on lighting education.

UNIVERSAL *presents* THE NEW *MERCURY* RANGES

. . . *with* "NUTRITIVE COOKING" for National Good Health!

Universal's new Mercury line of Electric Ranges for 1942 features "Nutritive Cooking"—cooking that results in more nutritious meals prepared easier in less time and at lower current costs.

To sell more Universal Ranges in '42, tell your customers how "Nutritive Cooking" seals the vitamins in the food. Tell how it conserves time for war work through automatic control. Tell how it conserves electricity through accurate, flexible control. Show how these things aid good health and national defense. Wire or write for complete information.

UNIVERSAL offers "NUTRITIVE COOKING" with these selling features that save vitamins, time and electricity

Universal

FEATURES GIVE MAXIMUM NUTRITION

War Makes Vitamins More Vital

Research workers have long emphasized the importance of sealing vitamins into food. And now, during the national emergency, is the time to turn their findings into action!

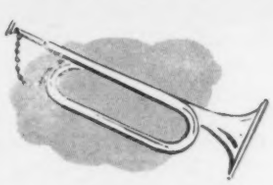
Mercury Ranges Meet the Challenge!

After years of testing in laboratory and kitchen, special Universal Mercury Range features now aid in sealing the vitamins in through waterless cooking and flexible controls.

Designed for Low Cost Meals

Mult-I-Heat Control, the Bake-Fast Oven and the Economy Cooker all contribute to the preparation of nourishing low cost meals—particularly desirable in time of rising costs and the need for extra nourishment.

NEWS FOR UNIVERSAL DEALERS!



Universal Answers the Call

Universal is cooperating wholeheartedly in the war program, but Universal is not losing sight of its responsibility to extend better living for consumers and dealers. After Government orders have been filled, everything humanly possible will be done to rush merchandise on the established pro rata allotment plan.

No Substitute for Universal Performance

If at any time in the opinion of our engineers, Universal appliances would fall below Universal performance standards by virtue of the use of alternate materials, such items will be withdrawn from our lines. The production of all items that do meet our standards is being maintained at a maximum peak within the limits of our capacity.

Allen Jones Heads G-E Central Station Dept.

Allen C. Jones has been appointed manager of the central station and transportation departments for the Pacific Coast district of the General Electric Co., according to R. M. Alvord, commercial vice-president. He has been manager of the same departments of the San Francisco office since 1932.

A native of North Carolina, Jones received his B. S. degree from Alabama Tech at Auburn in 1904 and his M. S. in 1905. That same year he enrolled in the G-E test course at Schnectady and has remained with the company since. He came to San Francisco in 1908 as control specialist and held various sales positions until he was made manager of the central station department in 1927. Responsibility for the transportation department was added in 1932.

He is past chairman of the San Francisco Section of the AIEE and served as secretary of the section for 18 years. He was chairman of the PCEA operating economics section in 1939 and in 1937 served as president of the San Francisco Engineers' Club.

GEO. E. HONN CO.
420 Market St. San Francisco, Calif.
Manufacturers' Representative for
THOMAS INSULATORS
S & C PROTECTIVE DEVICES
CORNELL-DUBILIER CAPACITORS
KELLEMS CABLE GRIPS
BLACKBURN CONNECTORS
COLUMBIA TONG TEST AMMETERS
—LOW VOLTAGE GENERATORS
BARTLETT TREE TRIMMING EQUIPMENT
METER JEWELS
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MADE IN U.S.A.
LUMINAIRES FLUORESCENTS
REFLECTORS FLOODLIGHTS
INDUSTRIAL AND COMMERCIAL LIGHTING EQUIPMENT
HOME OFFICE AND FACTORY
INGLEWOOD, CALIFORNIA
WAREHOUSES
SAN FRANCISCO — 460 7th Street
HOUSTON, TEXAS — 315 Crawford St.
REPRESENTATIVES
FRED ZAUGG — 907 N.W. Irving St. — Portland, Ore.
COAST SALES CO. — 307 Main Street — Seattle, Wash.
STEVENS SALES CO. — 41 Post Office Place — Salt Lake City, Utah
G. S. SPANGLER — 618 Colorado Bldg. — Denver, Colo.

Edison Company Announces Commercial Dept. Promotions

H. V. Busby, manager of the Southern California Edison Co.'s Pomona district for the past five years, has been appointed assistant commercial manager of the company, according to C. E. Houston, vice-president and assistant general manager. Busby, who assumed his new duties in the company's Los Angeles general offices Jan. 1, has been with the company for 23 years and has held a number of commercial executive positions, including district managerships at Inglewood and Lindsay as well as at Pomona.

Other Edison Co. personnel changes effective Jan. 1 are as follows:

H. N. Kemp, former assistant manager of the Ventura district, is the new Pomona district manager.

W. R. Teele, former Beverly Hills district manager, now is special representative in the Inglewood and Redondo districts, succeeding W. G. Partridge, retired.

C. M. Bliven is the new district manager at Beverly Hills, coming from Huntington Park where he was assistant district manager.

Changes in chief clerks were as follows: F. W. Nelson, Alhambra to Santa Monica; C. D. Shedenhelm, Santa Monica to Long Beach; D. P. Iverson, Long Beach to Alhambra.

● H. L. FARRAR, president of the Coast Counties Gas & Electric Co., has announced the following personnel changes: C. R. Hayden, formerly district manager of the Hollister district, is now district manager of the Imperial Division in El Centro. W. R. Snyder, formerly company representative in the Valley Division, office in Los Banos, is now district manager of the Hollister district with office in Hollister. G. H. Loosmore, formerly salesman in the Santa Cruz district, is now company representative in the Valley division. Max J. Baer, formerly electric salesman in the Gilroy district, is now electric salesman in the Santa Cruz district.

McClurkin Elected Head of West Coast Power Company

L. C. McClurkin, former president of the Arkansas Utilities Co., Helena, Ark., was made president of the West Coast Power Co., Nov. 15, headquarters in Portland, Ore. He has had an extensive career in the electric light and power industry, which started in 1920 with the Eastern Texas Electric Co. (now Gulf States). He served in various capacities with the various groups of that organization, notably while at Beaumont for two years, in the accounting department. Shortly after the company started special load-building activities, he was appointed sales manager at Port Arthur, Tex. In 1925 he was made sales manager of the Texas Division of the Western Public Service Co., which was acquired and operated as an independent company.

In 1934, he left that organization and went with the Texas-New Mexico Utilities Co. as sales manager and district manager. In 1939, he went to Helena, Mont., as vice-president and general manager of the Arkansas Utilities, later becoming its president.

In his present position with the Oregon company, McClurkin takes charge of five or six widely separated groups of properties extending from the Pacific coast of Oregon to central Idaho. The principal group is on the coast, centering around Newport. The principal industry there is lumber and there are also a large number of coast resort towns in that area.

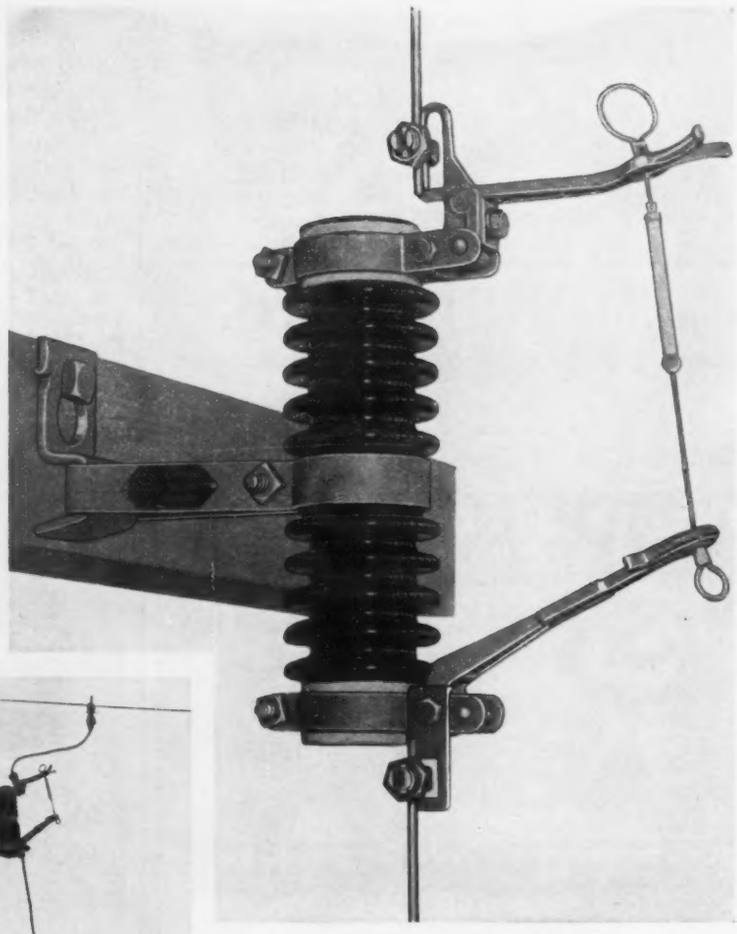
Al Nicoll Becomes President Of Graybar Electric Company

Alfred H. Nicoll, for the past two years assistant to President Frank A. Ketcham of Graybar Electric Co., Inc., has been named president of the company, effective Jan. 1, 1942. Ketcham now holds the position of chairman of the board of Graybar.

Nicoll was born and educated in San Francisco. His career in the electrical industry began in 1907 as a lamp salesman for M. A. Bryte. In 1909 he applied for a sales job to W. S. Berry, manager of Western Electric's supply department—and got it, as a sales record clerk. Later he was made sales assistant in the telephone and power apparatus departments. In 1912 he was sent to the Salt Lake house and won his way to the sales managership there. In 1920 he returned to San Francisco as specialty sales manager in charge of merchandising. In 1925 he became sales manager and on July 1, 1932, was made district manager.

Matthews Protectolink Cutouts Conserve Essential Defense Materials and Reduce Costs

Protectolinks Can Be Installed and Removed With Standard Ball Point Hot Stick



Made in the Following Sizes

• ● •

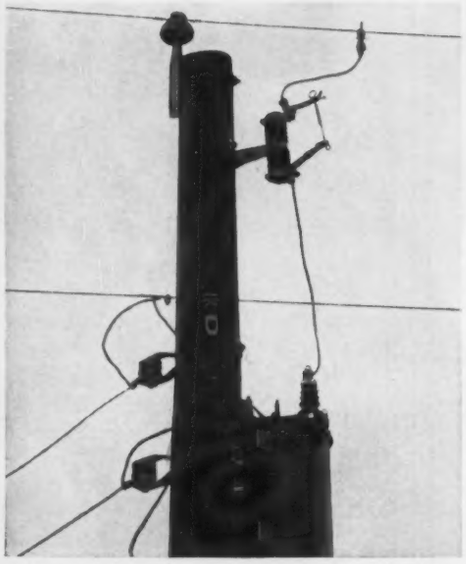
Catalog 1639
50 Amperes
5000 Volts

• ● •

Catalog 1640
50 Amperes
7.5/12.5 Kv.
Grd. Y

• ● •

Catalog 1641
50 Amperes
15000 Volts



Write for Bulletin 101
It Gives Complete Information

In this present emergency, the problem of conserving materials which are essential to our National Defense Program rests upon all of us. MATTHEWS PROTECTOLINK CUTOUTS use a minimum of copper and steel and the elimination of fuseholder tubes conserves fibre and bakelite; therefore they will help you to accomplish considerable savings in these materials and in addition show you dollar savings.

They are rugged in construction. Spring tensioned lower arm separates Protectolink instantly when short circuit or meltout occurs. Hooked lower arm and forked upper arm facilitates installation of Protectolink; these fuse links are designed so they cannot be installed upside down and will fit any make of open link cutout. Protectolink buttons fit snugly into cupshaped recesses in upper and lower contact arms, assuring positive and radio noise-proof contacts.

W. N. MATTHEWS CORPORATION
SAINT LOUIS, U. S. A.
ENGINEERS and MANUFACTURERS SINCE 1899

TRADE MARK REG. U.S. PAT. OFF.

Nichrome

Made only by DRIVER-HARRIS COMPANY

Stocked for the Coast Trade at

SAN FRANCISCO
235-241 San Bruno Ave.

LOS ANGELES
449 South San Pedro St.

SEATTLE
2122 Fourth Ave.

By

ANGUS-CAMPBELL, INC.

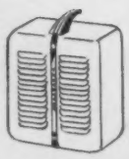
Sell PORTABLE ELECTRIC HEAT FOR GREATER PROFIT...

Feature this fast selling, long profit line for fall—Attractive, Dependable, Modern, Economical—and needed in every home. Order from your jobber NOW!

Sovac Leaguer, (LP 131) weighs 14½ lbs. has extra long cord for easy moving throughout home Attractive finishes in morocco brown or ivory 1320 watts, 120 volts, A.C. or D.C., Height 39½ in Base Diameter 10 in

Spred-Ray (MP 121) radiates heat in large arc. 1250 watts, 120 Volts, A.C. Chrome Top, duotone brown base and grille. Equipped with 6 feet of cord and spring action plug. Height 17⅛ in., Width 10 in., Depth 10 in.

Heat Fan (HF 161) Warms in winter, Cools in summer—Available in white or morocco brown. 1650 watts, 115 volts, Height 11⅛ in., Width 9⅛ in., Depth 5⅝ in



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A. W. Pride Takes on New Westinghouse Responsibilities

Alfred W. Pride, of Oakland, Calif., veteran of more than 20 years' service in various engineering and sales capacities, has been named commercial transformer engineer for the Westinghouse Electric & Manufacturing Co., with headquarters at the company's Emeryville, Calif., plant. In his new post, Pride will spend much of his time traveling throughout the western and Pacific Coast states comprising the Pacific Coast District, keeping salesmen and customers abreast of new technical developments in Westinghouse transformers.

A native of Amesbury, Mass., and a graduate of Worcester Polytechnic Institute, Pride joined Westinghouse in

PRIDE

September, 1915, as a student apprentice at East Pittsburgh, Pa. During the World War he saw service with both the Army and the Navy. Originally enlisted with the Army in October, 1917, he was transferred in February, 1918, to the Naval Experimental Station at New London, Conn. There he was commissioned an Ensign and did engineering work on submarine detection devices. He rejoined Westinghouse in 1922 in the company's Porcelain Department at Derry, Pa., and the following year came to the Pacific Coast. Since his transfer west, he has served in sales and engineering capacities in both the Transformer Division and the Porcelain Department at Emeryville.

● HARRY G. COCKRUM, rural service agent in the Yakima district of Pacific Power & Light Co., has resigned to join the staff of the University of Montana.

DEATHS

● W. T. NEWTON, electrical engineer for the American Can Co., active member of the San Francisco Electric Club and a member of the AIEE, died at his home in San Francisco Nov. 20.

● HANS OTTO STORM, chief engineer of the Globe Wireless, Ltd., was killed recently during the installation of a high voltage transmitter in the San Francisco headquarters of the company. Mr. Storm was not only a noted electrical engineer but also an author of note.

● DAVID I. WISHON, for many years Bakersfield district manager of the San Joaquin Light & Power Corp., and brother of A. G. Wishon, founder of the company, died in Bakersfield, Dec. 15. He joined his brother in the Mt. Whitney Power Co. at Visalia in 1894. He went with the San Joaquin in 1902 as engineer in charge of construction of the Tule River power development. In 1918 he became district manager at Bakersfield, holding that position until his retirement in 1937.

● JAMES W. REDPATH, died Nov. 6, in San Francisco. Mr. Redpath was a native San Franciscan, born in that city in 1881. On graduation from business school, Mr. Redpath was employed by the Southern Pacific Co. from 1898 until 1912 and from that time until 1928 was variously employed and was at one time State Secretary of the California Assn. of Electrical Contractors & Dealers and secretary of the San Francisco Electrical Development League. He joined Westinghouse Electrical Supply Co. in 1928 and had charge of service and claims department.

● H. V. CARPENTER, 67, dean of the college of mechanical arts and engineering and director of the engineering experiment station, Washington State College, Pullman, Wash., passed away Nov. 15. Dean Carpenter's first association with the college was as assistant professor of electrical engineering in 1901. He advanced to professor and head of the departments of mechanical and electrical engineering in 1905. In 1917 he became dean of the college of mechanical arts and engineering and was director of the engineering experiment station from 1919 to the time of his death. During 1935-36 he was on leave from the university acting as consultant for the Pacific Northwest Regional Planning Commission. Born in Illinois, Dean Carpenter received his engineering education at the University of Illinois.

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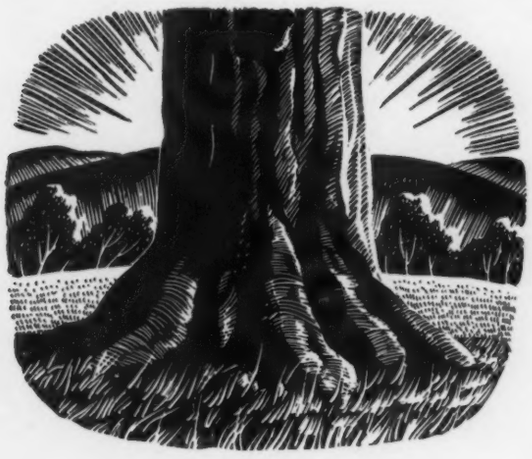
PROFILES *of the month*

Some mainlanders who met in Hawaii before the blitz recently included Malihini C. A. Dostal, Westinghouse Pacific Coast manager; Mrs. Fred Mulvaney, Fred Mulvaney, Maydwell & Hartzell, San Francisco; Paul Anderson, Hawaiian Electric Co., and W. W. Glosser, Pacific Coast vice-president of Hubbard & Co. Several more were there for the raid

Running Water Clinic at University of Washington, panel included Fred Jensen, Prof. C. W. Harris, M. Campbell, state health engineer; Dean E. A. Loew, moderator; J. C. Scott, Claude Stewart and C. W. Wildebour. Story next month. Below: F. H. Herzberger, P. S. of Colo., Denver; Robert Moss and W. J. Benning, of So. Colo. Power, Victor and Pueblo, at the RMEL convention at Estes Park

In War as in Nature ...Nourish the ROOTS



WITH THE NATION pouring its energies into a fight for decency and humanity, our new rule for living is to help in every way possible, but otherwise *to live as normally as possible.* Try to follow normal routines at home and in business. Make essential purchases, neither overbuying nor withholding. Remember that while "business as usual" is out—business *adapted to the circumstances* is absolutely vital to the continued strength and vitality of our "home front," which, in turn, is nourishing and supporting not only our own fighting forces but those of our valiant allies.

The P. G. and E., for its part, will conduct advertising and cooperative sales promotion with a view to keeping business on as even a keel as possible. Some appliances will not be pushed as forcibly as before; others will be left out entirely. But wherever there are appliances *on hand*—and their sale is entirely consistent with the nation's interests—we will certainly take the opportunity to assist business with promotional advertising.

On the basis of this resolve, we are beginning 1942 with advertising of portable electric heaters; cheerful, homey, better-sight lamps and lighting devices; and in certain specially designated areas, electric ranges. All these appliances are *"still available"*... and in quantities sufficient to meet present demands.

Dealers are invited to participate as always with tie-in advertisements giving specific prices and features, and pointing out that terms, while not available for extremely long periods, are still definitely liberal and all that most term buyers need or want. Such advertising, we believe, is bound to have good results.

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Find out what more you can do about it. Write to the Pacific Coast Electrical Bureau.

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